

SOIL SURVEY

Benton County Tennessee

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and the
TENNESSEE VALLEY AUTHORITY

How To Use THE SOIL SURVEY REPORT

FARMERS who have lived in one locality for a long time come to know about the soil differences on their own farms and on those of their immediate neighbors. What they do not know, unless a soil survey has been made, is how nearly their soils are like those at experiment stations or in other localities from which higher yields are reported. They do not know whether these higher yields are from soils like their own or so different that they could not hope to get equally high returns, even if they adopted the practices followed in these other places. The similarities and differences among soils are known only after a map of the soils has been made. Knowing what kind of soil one has and comparing it with soils on which new developments have proved successful will remove some of the risk in trying new methods and varieties.

SOILS OF A PARTICULAR FARM

To find what soils are on any farm or other land, locate the tract on the soil map, which is in the envelope inside the back cover. This is easily done by finding the boundaries of the farm by such landmarks as houses, roads, streams, villages, and other features shown on the map.

Each kind of soil is marked with a symbol on the map; for example, all soils marked Bcl are of the same kind. To find the name of the soil so marked, look at the legend printed near the margin of the map and find Bcl. The color where the symbol appears in the legend will be the same as where it appears on the map. The Bcl means Bodine cherty silt loam, hilly phase. A section of this report tells what Bodine cherty silt loam, hilly phase, is like, for what it is mainly used, and some of the uses to which it is suited.

How productive is Bodine cherty silt loam, hilly phase? Find the soil name in

the left-hand column of table 6, and note the yields of the different crops opposite it. This table also gives expectable yields for all the other soils mapped, so that the different soils may be compared.

Read in the section on Soil Types and Phases to learn what are good uses and management practices for this soil. Look also at the section on Use, Management, and Productivity of Benton County Soils and find the management group that contains Bodine cherty silt loam, hilly phase.

SOILS OF THE COUNTY AS A WHOLE

If a general idea of the soils of the county is wanted, read the introductory part of the section on Soils. This tells where the principal kinds are found, what they are like, and how they are related to one another. Then study the soil map and notice how the different kinds of soils tend to be arranged in different localities. These patterns are likely to be associated with well-recognized differences in type of farming and land use.

A newcomer who considers purchasing a farm in the county will want to know about the climate as well as the soils; the types and sizes of farms; the principal farm products and how they are marketed; the kinds and conditions of farm tenure; kinds of farm buildings, equipment, and machinery; availability of schools, churches, highways, railroads, and telephone and electric services; water supplies; and towns, villages, and population characteristics. This information will be found in the sections on General Nature of the Area and on Agriculture.

Students and others interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section on Morphology and Genesis of Soils.

This publication on the soil survey of Benton County, Tenn., is a cooperative contribution from the—

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SOIL SURVEY OF BENTON COUNTY, TENNESSEE

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United States Department of Agriculture in cooperation with the Tennessee Agricultural Experiment Station and the Tennessee Valley Authority

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¹ Division of Soil Survey was transferred to Soil Conservation Service on Nov. 15, 1952.

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BENTON COUNTY, though one of the first areas in western Tennessee to be settled, was not organized as a county until 1835. Early agriculture was of the usual pioneer type—crops were produced chiefly for home use. Present agriculture is of the same type—corn, cotton, lespedeza, and peanuts being the principal crops and oats, wheat, barley, soybeans, cowpeas, sorghum, vegetables, and fruits the less important ones. Beef cattle and hogs are the chief source of livestock cash income. Forests are a valuable resource. Although from early days there has been a gradual shifting from forestry to field crops, approximately 61 percent of the total area is still in forest. Woodland areas are well distributed, and a number of active sawmills are still operating. To provide a basis for the best agricultural uses of the land a cooperative soil survey was made by the United States Department of Agriculture, the Tennessee Agricultural Experiment Station, and the Tennessee Valley Authority. Field work was completed in 1941, and, unless otherwise specifically mentioned, all statements in this report refer to conditions in the county at that time.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Benton County occupies 275,904 acres in the northwestern part of Tennessee (fig. 1). Of this total, an area of 30,656 acres is inundated by the Kentucky Reservoir. The county extends about 50 miles along the west bank of the Tennessee River, which separates it from Stewart, Houston, Humphreys, and Perry Counties. It is bounded on the north

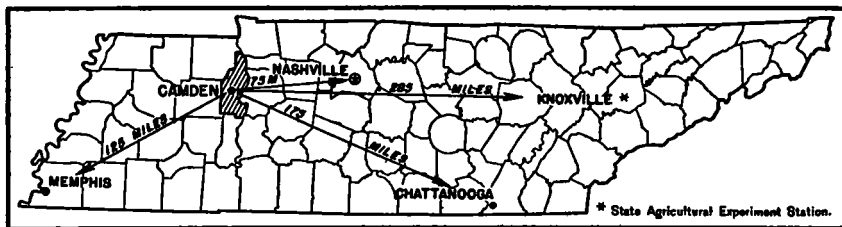


FIGURE 1.—Location of Benton County in Tennessee.

by Henry County, on the west by Henry and Carroll Counties, and on the south by Decatur County and the panhandle of Carroll County. Camden, the county seat and largest town, is 75 miles west of Nashville and 125 miles northeast of Memphis.

PHYSIOGRAPHY, GEOLOGY, RELIEF, AND DRAINAGE

Physiographically, the western part of the county is within the East Gulf Coastal Plain section of the Coastal Plain province and the rest is in the Highland Rim section of the Interior Low Plateau province. The boundary between these two physiographic divisions is only a rough generalization, as the ragged remains of Cretaceous Coastal Plain sands cap the high ridges in practically all parts of the Highland Rim section (4).^{2a}

Rocks exposed at the surface are largely of sedimentary origin and include limestone, shale, chert, sand, clay, and gravel, although silt of wind-blown origin covers a considerable area (fig. 2). The rocks are of widely different age and include beds deposited during the Silurian, Devonian, Mississippian, Cretaceous, and Quaternary periods. They have faulted and folded very little, and in most places the strata deviate but little from the horizontal. Most of the formations are thin. Those exposed in the Coastal Plain province are loose unconsolidated sediments of the Cretaceous and Quaternary ages. In the Highland Rim section consolidated limestone, chert, and shale of the Devonian and Mississippian ages are abundant.

The county has a rolling to hilly or even steep relief. Differences in the character of the bedrock in the different parts are reflected in the relief. On the basis of relief and character of bedrock the following four minor physiographic divisions (fig. 3) are recognized: (1) Cherty limestone hills, (2) loessal plain, (3) sandy Coastal Plain, and (4) alluvial plain.

The cherty limestone hill section has a hilly and steep topography, which is highly dissected and is characterized by narrow ridges, steep slopes, and narrow flood plains. The streams are relatively straight and swift flowing and form a fairly regular dendritic pattern. The character of the bedrock has influenced not only the relief but also the character of the soils. This area, which corresponds closely to the Bodine-Ennis-Humphreys soil association, is underlain chiefly by cherty limestone formations, although some massive limestone and shale are exposed.

^{2a} Italic numbers in parentheses refer to Literature Cited, p. 170.

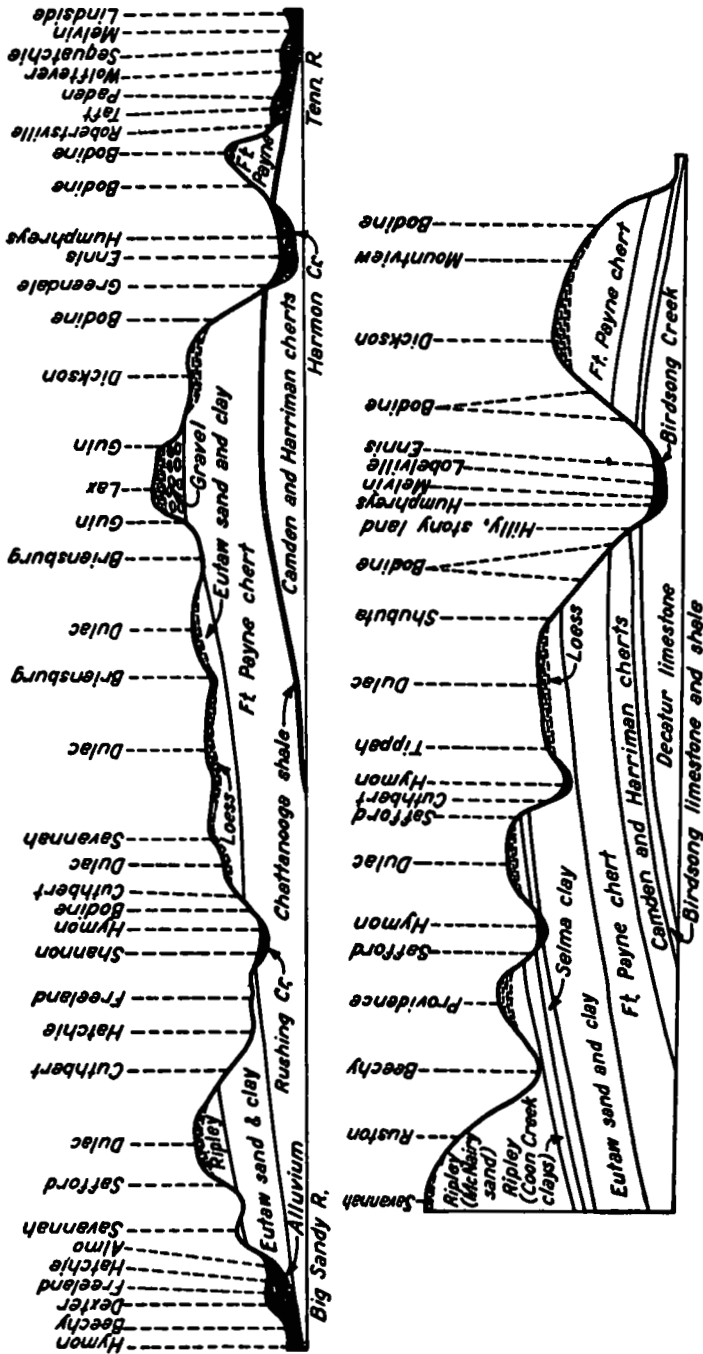


FIGURE 2.—Two diagrammatic east-west cross sections of Benton County, Tenn., showing geologic formations and related soils. The first section (A-B) is approximately one-third the length of the county from the northern boundary line; the second (O-D), one-third of the length of the county from the southern boundary line (see fig. 3).

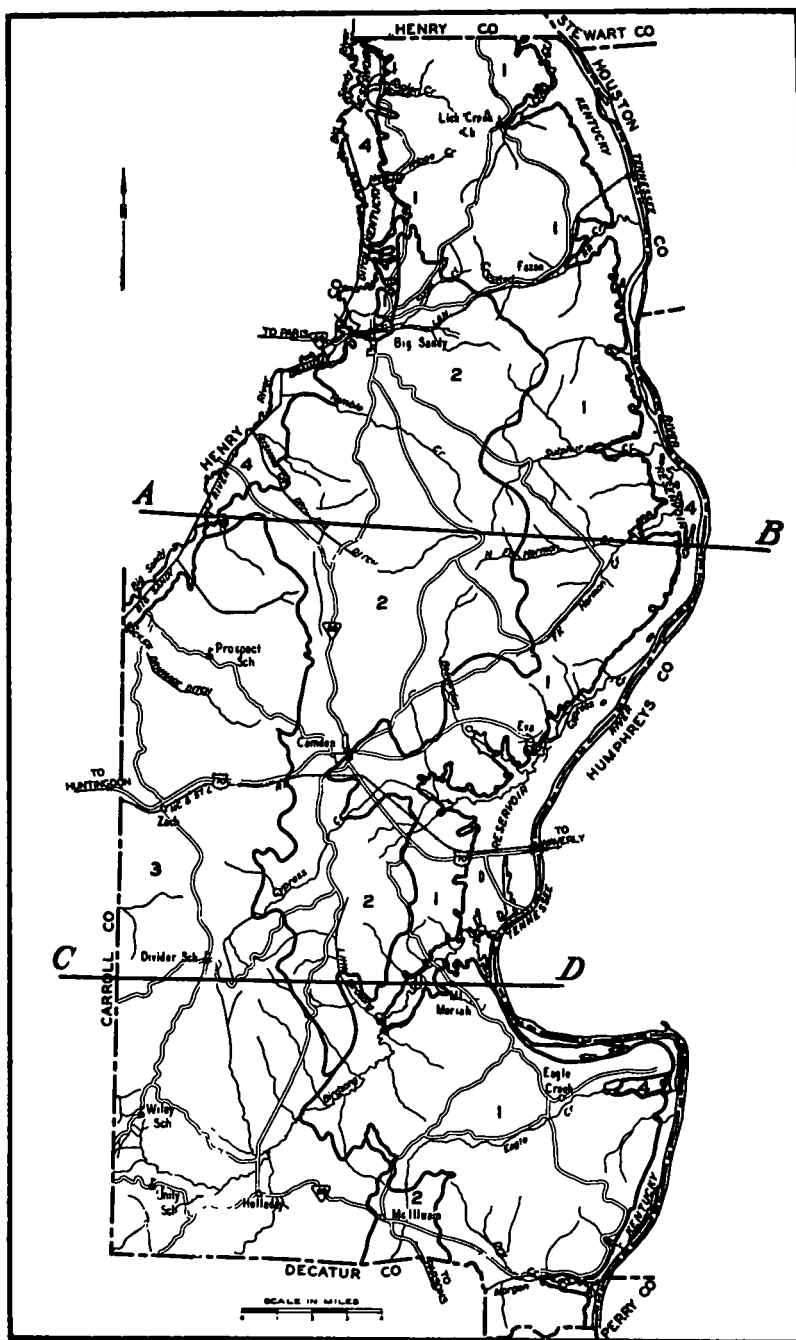


FIGURE 3.—Physiographic subdivisions of Benton County, Tenn.: (1) Cherty limestone hills, (2) loessal plain, (3) sandy Coastal Plain, and (4) alluvial plain.

The Decatur limestone, which is of high grade, is the oldest formation exposed in the county. It outcrops chiefly along Birdsong Creek and its tributaries. Its areal extent is small and its importance as a soil-forming rock is relatively insignificant. Birdsong shale also is exposed along Birdsong Creek and its tributaries. It consists chiefly of calcareous blue shale but includes some heavy-bedded coarsely crystalline limestone (3). The Harriman and Camden chert formations are more important than the Birdsong, as they outcrop extensively along Birdsong Creek, in the vicinity of Camden, and to a lesser extent along Rushing and Ramble Creeks and northeast of Big Sandy. Harriman chert is a thin-bedded buff to gray chert, while Camden chert is a buff-yellow brittle novaculite.

Fort Payne chert consists primarily of dense to porous chert beds interbedded with tripoli and siltstone, which are almost pure white but are stained by iron oxides in many places. The Fort Payne chert is the most extensive formation in this area. It is separated from the Harriman and Camden cherts by the Chattanooga shale (6). Although the exposure of this shale is very small and the quantity of soil formed is insignificant, the formation exerts a pronounced influence on both topography and drainage. The fractured chert has been replaced in places by limonite and cemented into a breccia (6). Soils developed from the weathered materials of this formation are very similar to those developed from the Camden and Harriman cherts.

A layer of Pliocene gravel varying in depth from 2 to 30 feet caps the ridges in the northern part and some of the ridge tops along the eastern side of the area. This formation consists of terrace and interstream deposits of chert, gravel, and sand, some of which may be of Pleistocene age. A thin layer of wind-blown loess covers many of the broader and smoother ridge crests throughout the area.

The loessal plain, a mildly dissected plain with broad ridge crests, long gentle slopes, and broad flood plains, has an undulating to rolling topography. The streams are sluggish and meander considerably within their flood plains. A thin layer of silt, thought to be Pleistocene loess, is found over most of the area. This layer has a maximum thickness of about 4 feet and is underlain by unconsolidated sands and clays of the Eutaw formation. These consist of fine- to medium-grained cross-bedded micaceous sands and interbedded lignite and more or less lignitic clay of various colors (12). This area corresponds closely to the Dulac-Savannah-Briensburg soil association area.

The sandy Coastal Plain area is highly dissected and predominantly hilly, the slopes ranging from 15 to 30 percent. The ridge tops are narrow and winding; the slopes, short and steep; the streams, very sluggish with wide poorly drained flood plains. This area is underlain by unconsolidated sands and clays.

The Coon Creek tongue, a member of the Ripley formation, outcrops in a relatively narrow band above the Eutaw formation. It consists of a greenish-gray micaceous glauconitic sandy clay, although the content of mica and green sand is variable. The McNairy sand member of the Ripley formation outcrops extensively in the western part of the county and is easily identified by its extreme sandy character. This member consists predominantly of medium- to coarse-grained sands, with some mica and glauconite as accessory

minerals. In many places the sands are strongly cross-bedded but elsewhere are parallel-bedded. The clays in the McNairy sand constitute only a minor part of the formation and range from inter-laminated layers a fraction of an inch to several inches thick. The sands are characteristically deep red to brown on the outcrop (12). A thin layer of loess covers most of the ridge crests to a depth of about 3 feet. This area includes the Ruston-Providence-Savannah and the Safford-Cuthbert-Ruston soil associations.

The alluvial plain, which includes the flood plain of the Tennessee and Big Sandy Rivers, has a maximum width of about 1 mile. The Tennessee River flood plain is gently undulating and consists of a natural levee near the stream and low ridges and intervening swales or sloughs running nearly parallel with the river. The flood plain is 10 to 25 feet above the normal river level and is subject to overflow. The low terraces, which are 5 to 10 feet above the general level of the flood plain, are included in this area. Underlying it is general alluvium washed from a variety of rocks, including limestone, sandstone, shale, and unconsolidated sands, clays, and silts. The flood plain of the Big Sandy River is not so high above the water level and is more nearly level than that of the Tennessee River. The alluvial plain section includes the Huntington-Egam-Wolftever and the Beechy-Hymon soil associations.

Benton County is drained by the Tennessee and Big Sandy Rivers and their many tributaries. The Tennessee River flows in a northerly direction all along the eastern border; the Big Sandy River is on the Henry County boundary and flows into the Tennessee River a few miles north of the northern dividing line between this and Henry County. Eagle, Birdsong, Harmon, Sulphur, Crooked, Lick, and Cypress Creeks are the principal streams flowing into Tennessee. Rushing, Ramble, and Sugar Creeks are the principal tributaries of the Big Sandy.

The county has a well-developed dendritic drainage pattern. In the Highland Rim section the drainage system is regular. The central part has a regular pattern, but the drains are more sluggish and have a tendency to meander. In the extreme western part the drains are short and crooked but the major streams are straight.

CLIMATE

The climate of the county is of the humid continental type. Mild winters, with only an occasional extreme cold spell, hot summers, and an average precipitation of about 50 inches are characteristic. Climatic conditions do not vary greatly within the county, but the Tennessee River influences the temperature of the adjacent area to some extent.

The normal monthly, seasonal, and annual temperature and precipitation at the Weather Bureau station at Perryville, Decatur County, are given in table 1. This station is on the bank of the Tennessee River about 20 miles south of the Benton County line, but its data are representative of Benton County.

The difference between mean winter and summer temperatures is 37° F. Infrequent extreme high and low temperatures, as those above 102° or below 0°, are to be expected. The lowest temperature ever recorded at the Perryville station was -10°, while the highest was

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Perryville, Decatur County, Tenn.*

[Elevation, 430 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snow-fall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December.....	41. 2	75	—3	5. 32	2. 45	3. 64	2. 0
January.....	40. 2	77	—10	5. 16	2. 64	6. 11	1. 4
February.....	42. 0	78	—3	4. 13	1. 26	3. 23	2. 2
Winter.....	41. 1	78	—10	14. 61	6. 35	12. 98	5. 6
March.....	51. 4	91	13	5. 50	1. 53	12. 19	. 8
April.....	59. 4	92	23	4. 68	2. 38	4. 75	(¹)
May.....	68. 1	99	35	4. 23	1. 10	5. 20	0
Spring.....	59. 6	99	13	14. 41	5. 01	22. 14	. 8
June.....	75. 9	106	41	4. 23	1. 41	3. 95	0
July.....	79. 6	113	48	3. 99	6. 76	1. 33	0
August.....	78. 9	113	48	3. 96	4. 43	7. 90	0
Summer.....	78. 1	113	41	12. 18	12. 60	13. 18	0
September.....	73. 2	111	32	3. 09	. 13	. 80	0
October.....	61. 0	97	23	3. 42	3. 50	9. 94	(¹)
November.....	49. 9	87	8	3. 78	3. 15	12. 41	. 3
Fall.....	61. 4	111	8	10. 29	6. 78	23. 15	. 3
Year.....	60. 1	113	—10	51. 49	*30. 74	*71. 45	6. 7

¹ Trace.² In 1941.³ In 1919.

113°. Temperatures above 102° occur on an average of once in 5 years and those below 0° once in 10 years. Temperatures somewhat above or below the normal high and low are to be expected at much shorter intervals than those of the extreme high and low. Lows of 5° to 0° occur in about 2 of every 4 years, while highs of 100° to 102° are recorded a few days in almost every year.

Few periods in either winter or summer are of such an extreme temperature as to interfere seriously with outside farm work. On the well-drained soils a variety of winter crops are grown with little danger of winterkilling, even though they receive no effective protection from a snow blanket. Some damage follows heaving on poorly drained and heavy-textured soils and on the more severely eroded soils, mostly because the plants do not get a vigorous start before cold weather.

The county has an average frost-free period of 192 days, from April 11 to October 21. This is ample time to grow and mature practically all the important field crops. Killing frosts have occurred as late as May 10 and as early as September 22. Frosts in September are

extremely rare, however, and a frost early in May is to be expected only about once in 5 years. Frost seldom damages corn and cotton, but late spring frosts frequently damage the fruit crop and lespedeza, the principal hay crop. Early fall frosts may damage corn that is planted late in the season on poorly drained bottom soils. The grazing period normally extends from about the last of March to the first of November. Some grazing of winter cover crops is practiced, especially late in winter and early in spring.

The annual rainfall of 51.49 inches is fairly well distributed throughout the year; the lightest precipitation is in summer and fall, coinciding with the ripening and harvesting of crops. The rainfall is ample for the most moisture-exacting crops, but much of it is lost through surface runoff. Most of the winter rains are slow and of long duration, while those of spring and summer usually consist of heavy downpours of short duration. The snowfalls are usually light, last only a few days, and account for only a small quantity of the annual precipitation.

Droughts that are severely damaging to crops are not very common, but some damage from lack of rain can be expected almost every year on certain soil types. Spring droughts are rare, but during July and August the lack of moisture often becomes pronounced owing to the nature of rainfall and the excessive evaporation caused by high temperatures. Periods of drought during the fall seeding period are frequent and damage the winter cover crops by killing the stand or by delaying growth until the plants become susceptible to winter-killing.

Wet periods of sufficient length to prevent farm operations occur frequently in winter and spring. On well-drained soils of the uplands these periods merely delay seeding and do not necessarily reduce yields. On imperfectly and poorly drained soils, however, seeding may be so delayed that the yields are reduced materially. Sprouted and growing crops are seldom damaged by excessive rainfall except on soils that are poorly drained or have sluggish surface drainage. Spring floods in small creek bottoms sometimes damage growing crops. At rare intervals the Tennessee River overflows its flood plain during the growing season or before the crops have been harvested. At harvesttime, red clover and other hay crops frequently are damaged severely by extended wet periods. Excessive rainfall is detrimental not so much in reducing the crop yields as in increasing the cost of production. It encourages weed growth, and consequently more cultivation is required.

Southwesterly winds of mild velocity are frequent in March and April. The summer and fall months are usually calm, with some mild breezes. Cold northerly winds are common in winter. Winds seldom reach a velocity sufficient to do much damage, and tornadoes are extremely rare. At rather long intervals, usually early in spring, severe storms are accompanied by winds of such high velocity as to damage crops and property.

WATER SUPPLY

Streams, springs, and wells amply supply practically all the county with water. Permanent-flowing streams are found in all sections

but are not so numerous in the cherty limestone hills, where there are numerous springs that have water flowing beneath the gravel in the stream beds. Water can be obtained in the valleys at all times from shallow wells. In the loessal plain section the wells are usually moderately shallow, the depth varying from about 20 to 50 feet, and in this area artificial ponds furnish much of the water for livestock. In the sandy Coastal Plain section it is not difficult to get water for livestock, because numerous seepage springs occur at the foot of the sandy slopes. Deep wells and cisterns furnish most of the water used by the people.

The Tennessee River and many of the larger creeks provide recreational opportunities, swimming, boating, and fishing, as also does Kentucky Lake, on the eastern side of the county.

VEGETATION

About 61 percent of the county is in forest. Woodland areas are well distributed, and practically every farm has some woodland. Before the arrival of the white settlers nearly all of the county was in deciduous forests (13). The only large forests at present are on soils undesirable for crops, as in the cherty limestone hills and the rough sandy Coastal Plain section. The principal soils in forest are members of the Bodine, Cuthbert, Safford, and Ruston series. Forests on other soil types are in relatively small individual areas.

The forests consist primarily of deciduous trees but include a few scattered cedars and pines. The predominating trees in the uplands are red, white, blackjack, chestnut, and post oaks, hickory, dogwood, sourwood, and elm; in the bottom lands, maple, willow, sycamore, ash, beech, boxelder, and hackberry. Other less important trees are cottonwood, black tupelo (blackgum), sweetgum, cypress, black walnut, red-cedar, black locust, and honeylocust (5).

ORGANIZATION AND POPULATION

Benton County was one of the first areas in western Tennessee to be under organized government but one of the last to be formed into a distinct county. It was established on November 24, 1835, from the part of Humphreys County west of the Tennessee River and part of Henry County.

The first settlers began to arrive in the area soon after western Tennessee was purchased from the Chickasaw Indians in 1818 (13). The first permanent settlement was made in 1819 by Willis and Dennis Rushing, on Rushing Creek, 6 miles north of the present town of Camden. A heavy influx, principally from middle and eastern Tennessee and from North Carolina (8), immediately followed this first settlement. The population of the county has not changed greatly since 1900; in 1950 it was 11,495. Camden, the county seat and largest town, was laid out in 1836 and is now the principal trading center. In 1950 its population was 2,029. The importance of smaller towns or villages as trading centers—Big Sandy, Holladay, Eva, Faxon, and Sawyers Mill—has decreased with the improvement of transportation facilities.

ROADS AND RAILROADS

The Nashville, Chattanooga, and St. Louis Railway passes through Camden and crosses the county from east to west. The Louisville and Nashville Railroad crosses the northern part of the county, passing through Big Sandy and Faxon. Federal Highway No. 70, a hard-surfaced road, follows about the same route as the Nashville, Chattanooga, and St. Louis Railway. State Highway No. 69 connects Big Sandy, Camden, Holladay, and McIlwain. This road is hard-surfaced from Big Sandy to Camden. State or county roads reach all sections of the county. Paved or graveled, they are well maintained and provide easily traveled routes to market at all seasons. In 1940 there were 57 farm homes on hard-surfaced roads; 1,102, on graveled roads; 111, on improved dirt roads; and 225, on unimproved dirt roads.

SCHOOLS, CHURCHES, AND FARM HOME IMPROVEMENTS

Most farms are near elementary and high schools or else are on school bus routes. There are no institutions providing facilities for higher education within the county, but colleges and universities at Nashville, Jackson, and Martin are less than 100 miles distant. Churches are in all towns, and small country churches are in all parts of the county.

Few farm homes are equipped with modern conveniences. Only 38 farms had electric lights in 1940 and 86 had telephones. The type and condition of the farm structures are generally an expression of soil productivity and land conditions. The farms having the better soils and a higher proportion of cropland, as those on the Huntington-Egam-Wolftever association, have much better farm structures than those having poor soils and a smaller proportion of crop and pasture land, as farms on the Ruston-Providence-Savannah association.

AGRICULTURE

The Chickasaw Indians claimed this area prior to 1818 (13), and the abundance of Indian relics indicates that at least semipermanent camps were established, chiefly on the well-drained terraces of the Tennessee and the Big Sandy Rivers. The Indians apparently practiced a crude agriculture, consisting chiefly of corn production.

The first white settlements were near the Tennessee River, which was the most important of the transportation routes. The pioneers were largely self-sustaining. During the first few years they supplemented the food from the farm with deer, turkey, and other wild game. Practically all the products were grown for home or local consumption. Corn was the principal crop, with vegetables, small grains, and cotton of secondary importance. Later the cotton gin so stimulated production that cotton became a cash crop and changed farming from a subsistence type to a cotton type, supplemented with livestock and forest products. A tobacco factory built in Camden in 1855 created a market for the tobacco that had been grown chiefly for home use. The growing of peanuts began about 1870. This was an even better cash crop than cotton for a few years, and considerable acreage was grown until recently (8).

CROPS

Most of the farmers of the county follow a cotton type of farming, supplemented with livestock and forest products. Corn is grown on a larger acreage but cotton is the more important cash crop. The acreage of the principal crops and the number of bearing fruit trees and grapevines in the county in stated years are shown in table 2.

TABLE 2.—*Acreage of principal crops and number of bearing fruit trees and grapevines in Benton County, Tenn., in stated years*¹

Crop	1919	1929	1939	1944
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Corn.....	30, 669	25, 910	23, 481	17, 319
Cotton.....	4, 870	7, 586	5, 019	2, 970
Oats.....	134	16	167	404
Wheat.....	554	19	266	235
Dry peas.....	522	1, 613	770	328
Dry edible beans.....	42	1, 865	139	3, 745
Peanuts.....	1, 298	2, 467	720	611
Potatoes.....	51	239	178	249
Sweetpotatoes and yams.....	124	172	116	(²)
Tobacco.....	97	35	(²)	(²)
Vegetables.....	6	80	14	16
Sorghum cane (for sirup).....	387	458	439	(²)
All hay.....	9, 696	8, 253	12, 322	7, 778
Lespedeza hay.....	(³)	(³)	7, 343	4, 208
Timothy and clover mixed.....	297	228	162	189
Clover alone, all kinds.....	235	396	(²)	(²)
Alfalfa.....	12	56	65	44
Other tame hay.....	2, 460	2, 424	320	125
Small grains cut green.....	854	241	7	61
Annual legumes saved for hay.....	5, 482	4, 228	4, 224	2, 989
Wild, salt, or prairie grasses.....	356	680	201	162
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Peach.....trees.....	14, 138	12, 616	18, 751	17, 425
Apple.....do.....	11, 006	8, 428	10, 349	10, 002
Grapevines.....	662	116	1, 226	1, 445

¹ Trees and vines reported for years 1920, 1930, 1940, and 1945, respectively.

² Soybeans only.

³ Not reported.

⁴ Includes clover.

CORN

Corn, having a wide range of adaptability, is grown on most farms. The greater part is on bottom lands along the Tennessee and the Big Sandy Rivers and their tributaries; comparatively little is on soils of the uplands.

Although corn can be grown on a wide variety of soils, there is a great difference in the yields on the various soil types. Huntington, Ennis, and Shannon soils produce the highest yields. The Egam soil produces very good yields when the moisture supply is adequate, but the crop is too susceptible to injury from drought for this to be considered an excellent soil for corn production. Except in very rainy seasons, high corn yields are obtained on the imperfectly drained

bottom and colluvial soils, as Lindside, Lobelville, Hymon, and Briensburg. The poorly drained bottom soils, Beechy and Melvin, produce good yields in dry seasons. The well-drained colluvial soils, Alva and Greendale, are well suited to corn production and usually give high yields. Corn is moderately well suited to most of the better soils of the uplands, and when grown in rotation following a legume crop it produces medium to high yields.

A large part of the corn crop is used on the farm, and most of the rest within the county. Tennessee River-bottom farmers produce most of the surplus, which is usually sold locally to neighboring farmers or marketed indirectly through livestock. The county at present produces most of the corn needed, but with the flooding of the Tennessee River and the Big Sandy River bottoms by the Kentucky Reservoir its chief corn-producing areas will be lost.

COTTON

Cotton, the most important cash crop, is produced on most farms, although the acreage for each farm is small (pl. 1, A). It is grown chiefly on the siltpan soils of the uplands and high terraces, as on the Dulac, Providence, Paden, and Freeland soils. The total acreage has varied through the years, with a general upward trend until 1939, but since then a decided decrease. Following a maximum of 7,586 acres in 1929, there was a great decrease in the next 15 years. A gradual increase in yields, however, probably has resulted from the more liberal use of commercial fertilizer and of higher yielding varieties.

The principal cotton-growing areas are (1) the low terraces along the Tennessee River; (2) the terraces along the Big Sandy River; and (3) the loessal plain section in the central part of the county. Wolftever and Sequatchie soils are the principal cotton-producing soils on the low Tennessee River terraces. On the Big Sandy River terraces, most of the cotton is produced on Freeland and Dexter soils; and in the uplands most of it is on Dulac and Dickson soils. It is not grown on the soils of the first bottoms to any great extent, partly because of competition with corn. Although cotton makes a vigorous vegetative growth on these soils, it does not fruit well, matures slowly, and is susceptible to diseases and insects.

PEANUTS

Before 1919 peanuts were an important cash crop—at one time more important than cotton—and were grown in practically all parts of the county. In recent years the crop has been largely replaced by cotton, both in acreage and in cash value. Peanuts are now restricted largely to the low terraces and bottoms of the Highland Rim section. The Ennis, Humphreys, and Greendale soils of this area are very well suited to the crop (pl. 1, B).

HAY

Census data, though not complete for all the census years, indicate a shift from grass hays and small grains cut for hay to legumes. The principal hay crops are soybeans (pl. 1, C), cowpeas, timothy, redtop (herd's-grass), red clover, lespedeza, and small grains. Lespedeza, soybeans, and cowpeas make up the bulk of the hay now harvested. The lespedeza, bean, and grass hays are grown chiefly on the imperfectly and poorly drained bottom soils, while cowpea hay is grown on

the eroded upland soils. Practically all the hay is fed on the farm or in the locality where grown. The small number of livestock on each farm has resulted in a low hay requirement and consequently in a small acreage per farm.

PASTURE

In 1940 there were 17,362 acres of plowable pasture in the county, an average of 9.4 acres to each farm. The plowable pasture is usually on the more eroded upland soils that are less desirable for crop production or on bottom lands that are uncertain crop-producing soils because of poor drainage, susceptibility to flooding, or both. Woodland pasture is on practically every soil type but most is on soils of hilly or steep relief, as the Bodine, Cuthbert, Ruston, and Safford. Other pasture is more or less permanent in character and in most cases occupies soils that are unsuitable for continued crop production because of poor drainage or severe erosion. Lespedeza is the principal pasture plant, and sometimes grown with it are timothy, redtop, Bermuda grass, orchard grass, or ryegrass. The permanent pastures usually consist of lespedeza, wild grasses, as crabgrass and swamp-grasses, Bermuda grass, and some white and hop clovers.

The pastures, usually poorly managed, are in most cases only on poor soils. The upland soils are not naturally productive of nutritious grasses and clovers, especially after they have been depleted by cropping. The quality and carrying capacity of pastures on these depleted upland soils are low. In recent years a few high-yielding pastures have been developed on upland soils through proper seeding and the use of liberal quantities of lime and phosphate. Some good-quality pastures with good carrying capacity also are on the poorly drained bottom soils that have been seeded to a good pasture mixture and freed from weeds.

MINOR CROPS

Certain other crops, as wheat, oats, and tobacco, all of which were at one time important in the county, are now grown only as minor crops. An increase in their acreage during recent years has been due principally to their value as cover crops. Tobacco has become relatively unimportant as a cash crop.

Small acreages of sweetpotatoes, potatoes, sorghum, peas, and beans are grown on most farms, principally for home use, though sorghum is a cash crop for a few farmers. The acreage of these crops has always been small, but it has shown an increase in recent years. Most of the farms have a small garden in which string beans, lima beans, peas, squash, tomatoes, turnips, onions, lettuce, okra, cabbage, radishes, peppers, mustard, and cucumbers are grown for home use. These gardens are usually on the more fertile soils, as the Greendale, Briensburg, and Alva. Sorghum cane for sirup is usually grown on bottom soils. The poorly drained Beechy soil apparently produces the best quality sirup of any soils in the county. A few apples, peaches, and grapes are grown in the small home orchard for home use only, and any surplus is sold locally.

AGRICULTURAL PRACTICES

Agricultural practices vary somewhat according to differences in soil type, lay of land, and size of farm. Modern machinery is generally used on the larger farms of the smooth to rolling areas of the

uplands and on the river bottoms. Much of the tillage in hilly areas and on small farms is with one- or two-horse implements. The small grain is generally harvested with small combines, as also is the seed of the legume crops, as lespedeza, crimson clover, vetch, and soybeans. Cotton and corn crops are practically all harvested by hand. Most of the small grains, as wheat, rye, oats, and barley, are planted in fall and harvested in June or July, though part of the oat crop is planted early in spring. Legumes, crimson clover and vetch, are sown in fall and plowed under in April or May or harvested for seed in June. Timothy and red clover are sown in either fall or spring. Corn is generally planted during April and May, some as late as June 20. Cotton is planted from about May 1 to 10; peanuts from April 20 to May 20.

The use of lime and commercial fertilizer has shown a great increase—to \$27,204 in 1929; in 1939, however, only \$17,154 was so spent, but this did not include 523 tons of phosphate obtained through the Production and Marketing Administration. In 1939 about 507 tons of lime were used. Most of the fertilizer is factory mixed. Manure is commonly applied to vegetable and truck crops. Practically all the commercial fertilizer is used on cotton, but some is used on sorghum and corn. The fertilizer generally used on cotton is a 4-8-4² or 2-10-2 mixture or 20-percent superphosphate. Some farmers side-dress the cotton with nitrate of soda. The lime and phosphate fertilizers are largely used under legume or grass crops. The application of phosphate fertilizer and lime on pasture and hay crops is becoming a more common practice, largely as a result of government-sponsored agricultural programs.

LIVESTOCK AND LIVESTOCK PRODUCTS

A gradual decrease in the number of most domestic animals on farms in the county from 1920 to 1945 is shown in table 3.

TABLE 3.—*Number of domestic animals on farms in Benton County, Tenn., in stated years*

Livestock	1920	1930	1940	1945
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Horses.....	1, 771	861	760	566
Mules.....	3, 336	3, 352	2, 337	1, 933
Cattle.....	6, 859	4, 295	4, 269	4, 301
Sheep.....	1, 546	755	412	575
Goats.....	134	192	¹ 569	307
Swine.....	17, 996	7, 809	8, 186	5, 678
Poultry.....	76, 712	55, 767	48, 873	² 62, 239

¹ Over 4 months old, Apr. 1, 1940.

² Chickens alone.

In 1945 there were 4,301 cattle in the county, mostly kept for the production of milk for home use. In 1940, 1,356 farmers reported that 2,337 of the total of 4,269 cows were kept for milk production.

³ Percentages of nitrogen, phosphoric acid, and potash, respectively.



A. Cotton growing on siltpan soils of the uplands.
B. Young crop of peanuts on Ennis cherty silt loam.
C. Soybean hay on Hyman and Beechy soils.



A, Landscape showing the light-gray poorly drained Beechy soils on nearly level flood plains.
B, Pasture on the Beechy soils.
C, Permanent pasture on Bodine cherty silt loam, hilly phase; tilled crops on the associated Greendale soils.

Only 4 farms were classed as dairy farms. Forty-nine farmers reported 208 cows kept for beef production. The herds of beef cattle are small; very few have more than 15. The majority of the cattle are grades of Jersey, with a few herds of good-grade Hereford, Aberdeen Angus, and Shorthorn.

About one-third as many hogs were in the county in 1945 as in 1920, the greatest decrease being between 1920 and 1930. The principal breeds are Duroc-Jersey, Poland China, and Chester White, or crosses of these. Many of the hogs are butchered and consumed on the farm where raised. Surplus corn is usually marketed indirectly through the hogs.

Only about one-third as many sheep were raised in 1945 as in 1920. The most rapid decrease in the number was between 1920 and 1930. The few farmers that keep sheep realize a good cash income from the sale of lambs and wool in proportion to the labor required. The principal breeds are Hampshire and Southdown.

The number of goats raised, though still relatively insignificant, has been steadily increasing.

The work stock at present consists chiefly of mules. In 1945 there was a total of 1,933 mules and 566 horses. The number of work animals had gradually increased up to 1920 but since then the decrease has been fairly rapid, owing partly to replacement by tractors.

Poultry, which in this county consists almost entirely of chickens—62,239 were reported in 1945—is the most widely distributed class of livestock. Almost every farm has a small flock, and there are very few large flocks. The poultry and poultry products are for the most part consumed on the farm, yet they are an important source of cash income to many families. Plymouth Rock is the most popular breed. The breeds of chickens are much purer than the breeds of livestock.

TYPE AND SIZE OF FARMS

In the classification of the farms of the county by major source of income, according to the value of farm products sold, traded, or used by farm households, the 1940 census gives the following numbers for the classes specified: Farm products used by farm households, 1,219; field crops sold or traded, 267; livestock sold or traded, 99; forest products sold, 20; poultry or poultry products sold or traded, 9; and dairy products sold or traded, 4. The sizes of farms in that year were as follows: From 3 to less than 29 acres, 300; 30 to 99 acres, 691; 100 to 179 acres, 418; 180 to 259 acres, 140; 260 to 499 acres, 86; 500 to 999 acres, 25; and more than 1,000 acres, 3.

LAND USE

A general shifting from forestry to crops since 1818 has been noted in the use of the land. This change was rapid at first, with the greatest total acreage of improved land, 90,263 acres, reported in 1910.

About 70 percent of the total land area is in farms. Since the total acreage in farms has not changed significantly, any increase in number of farms has meant a decrease in size. The number of farms reached the maximum of 2,136 in 1910, an average of 107.5 acres each. In 1940 the acreage had changed but little, the average being 106.2. In 1940, 63,388 of the 172,935 acres in farms were used for cropland;

17,362 were in plowable pasture; 70,836 in woodland; and 21,349, in wasteland, house sites, barnyards, feed lots, or other noncrop uses.

FARM TENURE

A large proportion of the farms in the county is owner-operated, although a significant proportion, 37.4 percent in 1940, is operated by tenants. In 1939, 723 farms were operated by full owners, 295 by part owners, 609 by tenants, and 2 by farm managers.

There are three classes of tenants in the county (1) The cash renter, (2) the share renter, and (3) the share cropper. The cash renter pays the owner a stipulated cash rent by the acre. Very little land is rented this way, and definite cash rental prices have not been established.

The share renters constitute the largest group. They furnish all the labor, equipment, work stock, and seed and give the landlord one-fourth of the cash crops and one-third of the feed crops. In some cases the landlord furnishes fertilizer in proportion to the share of the crop that he receives.

The share cropper furnishes all the labor and half the fertilizer and seed, and receives half of all the crops. The landlord furnishes the land, all equipment and work stock, and half the fertilizer and seed.

FARM INVESTMENTS AND EXPENDITURES

The average investment for each farm was \$2,385 in 1940. The value of land and buildings accounted for 80.1 percent of this amount. The relative value of the farm buildings has increased to 22.4 percent; that of domestic animals decreased to 13.4 percent. The value of farm machinery for each farm has been low, but with increased mechanization in recent years this investment has increased appreciably. About 52 percent of the farmers used commercial fertilizer in 1940, with an average expenditure of \$20 per farm.

The number of farms reporting expenditures for feed and the amount spent show a decided increase in recent years. About 51 percent of all farmers in 1940 reported a total expenditure of \$44,663, or \$54.59 each. Some corn and hay are purchased, but the largest expenditure is for protein supplements, as tankage and cottonseed meal, and for bran and mixed feeds.

The number of farms reporting expenditures for labor has remained almost constant. An average of \$61.50 was spent by 24.4 percent of the farmers in 1920; \$63.89 by 25.5 percent, in 1930; and \$76.48 by 21.4 percent, in 1940. A large part of the farm labor is furnished by the tenant families.

SOIL SURVEY METHODS AND DEFINITIONS

In making a soil survey the soils are examined, classified, and mapped in the field and their characteristics recorded, particularly in regard to the growth of various crops, grasses, and trees.

The soils and the underlying formations are examined systematically in many locations. Test pits are dug, borings made, and highway or railroad cuts and other exposures studied. Each excavation reveals a series of distinct soil layers, or horizons, termed collectively

the soil profile. Each horizon of the soil, as well as the underlying parent material, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stones are noted. The chemical reaction of the soil and its content of lime and salts are determined by simple tests. Other features taken into consideration are the drainage, both external and internal, the relief, or lay of the land, and the interrelations of soil and vegetation.

The soils are classified according to their characteristics, both internal and external, with special emphasis upon those features that influence the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics they are grouped in the following classification units: (1) Series, (2) types, (3) phases, (4) complexes, and (5) miscellaneous land types.

The series is a group of soils having the same genetic horizons, similar in important characteristics and arrangement in the soil profile, and having similar parent material. Thus, the series comprises soils having essentially the same color, structure, natural drainage, and other important internal characteristics and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The series are given geographic names taken from localities near which they were first found. Savannah, Bodine, Ruston, and Dulac are names of important series in this county.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of this texture—as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, or clay—is added to the series designation to give a complete name to the soil type. For example, Lindside silt loam and Lindside silty clay loam are soil types within the Lindside series. Except for the texture of the surface soil, these types have approximately the same internal and external characteristics.

The soil type or, where the soil type is subdivided into phases, the soil phase, is the most nearly uniform of the different classes of soils and has the narrowest range of characteristics. For this reason land use and soil management practices can be more definitely specified for it than for broader groups of soils of greater variation. Where two or more soils of a type are mapped, one without phase designation, that one is referred to as the normal phase of the type.

A soil phase, specifically named, is a variation within the type. The phases of a soil type differ from one another in some feature, generally external, that may be of special practical significance but do not differ in the major characteristics of the soil profile. For example, within the normal range of relief of a soil type some areas may be adapted to the use of farm machinery and the growth of cultivated crops and others may not. Differences in relief and in degree of accelerated erosion may be shown as phases. Even though no important differences may be apparent in the soil profile or in the capability of the soil to grow native vegetation throughout the range in relief, there may be important differences in respect to the growth or harvesting of cultivated crops. In such instances the more sloping parts of the soil types may be segregated on the map as undulating, rolling, or hilly phases; for example, Dulac silt loam, rolling phase.

In some places two or more soil units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a small-scale map but must be mapped as a complex, as the Lexington-Ruston complex.

Some areas of land that have little or no true soil are termed miscellaneous land types. Examples in this county are Hilly stony land (Talbot and Colbert soil materials), Rough gullied land (Cuthbert soil material), and Rough gullied land (Ruston soil material).

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, and other cultural and natural features of the landscape.

Texture refers to the relative quantities of clay, silt, and the various grades of sand making up the soil mass. Light-textured soils contain much of the coarser separates (sand), and heavy-textured soils contain much clay. Structure refers to the natural arrangement of the soil material into aggregates, structural particles, or masses. Consistence refers to such conditions as friability, plasticity, stickiness, hardness, compactness, and cementation; it is the relative mutual attraction of the particles in the whole soil mass or their resistance to separation or deformation.

Permeability and perviousness connote the ease with which water, air, and roots penetrate the soil. Surface soil ordinarily refers to the lighter textured surface layer, which usually ranges from 5 to 10 inches in thickness. The layer just below the surface soil, which is generally heavier textured, is called the subsoil. The substratum is beneath the subsoil and is characteristically splotched or mottled with two or more colors. In a practical sense the degree of acidity may be thought of as the degree of poverty in lime (available calcium). An acid soil is low in the relative content of lime, a neutral soil is about medium, and an alkaline soil is high. The term reaction^a refers to the condition of the soil as regards the degree of acidity.

SOILS

The well-developed soils of Benton County are confined to the uplands and high terraces and have developed in an environment of moderately high temperature, heavy rainfall, and forest vegetation. Because of this environment, the soils, particularly those of the uplands, have been severely leached and are consequently acid and low in fertility and organic matter. They differ in fertility and in content of organic matter, even in the virgin state, and such differences have been further widened by cropping, erosion, and other artificially stimulated processes of impoverishment. In contrast to the soils of

^a The reaction of the soil is its degree of acidity or alkalinity, expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values, alkalinity; lower values, acidity. Terms here commonly used that refer to reaction are defined in the Soil Survey Manual (7) as follows:

<i>pH value</i>	<i>pH value</i>
Extremely acid..... Below 4.5	Neutral 6.6-7.3
Very strongly acid..... 4.5-5.0	Mildly alkaline 7.4-8.0
Strongly acid..... 5.1-5.5	Strongly alkaline..... 8.1-9.0
Medium acid..... 5.6-6.0	Very strongly
Slightly acid..... 6.1-6.5	alkaline..... 9.1 and higher

uplands and high terraces (high benches), many of the soils of the bottoms and low terraces (second bottoms) are relatively high in natural fertility; moderately well supplied with bases, especially lime; and fairly well supplied with organic matter.

The soils of the county differ greatly in color, texture, consistence, reaction, fertility, relief, stoniness, depth to and character of underlying material, permeability, and drainage. These characteristics affect their productivity, workability, and conservability and, accordingly, the agricultural uses to which they are suited.

In color the soils range from nearly white through gray, yellow, and brown to red. Colors intermediate between brown and light gray predominate in the surface soil, whereas brown and yellow predominate in the subsoil.

In texture and consistence the soils vary from loose incoherent sand to tough tenacious clay. The surface soil is predominantly silt loam and fine sandy loam and is for the most part mellow and friable. The subsoil is silty clay loam and clay, ranging from friable to very strongly plastic.

In fertility and reaction the soils vary greatly. Most are strongly to very strongly acid; a significant proportion are only slightly to medium acid. Some are very low in natural fertility; others are relatively high; most are intermediate between these two extremes. The content of organic matter is generally not high, but the soils differ considerably in this respect.

In slope these soils are prevailing rolling to hilly, ranging from nearly level to steep. The degree of erosion varies greatly. Some soils are uneroded or only slightly eroded; some, moderately eroded; others, severely eroded; and a small number are mapped as rough gullied land.

In most of the soils developed over limestone, loose fragments of chert that interfere materially with cultivation are common. Areas with numerous outcrops of limestone are mapped as Hilly stony land (Talbot and Colbert soil materials).

A conspicuous feature of most of the soils on uplands and terraces of gentle slope is a compact layer, generally referred to as siltpan or claypan. In most soils of this sort the compact layer is at a depth of about 2 feet, but in some it is at a shallower depth. In most of the soils the tilth is favorable, although many are subject to puddling, surface baking, and clodding when tilled under unfavorable moisture conditions. Most of the soils are well drained; a few are poorly or imperfectly drained.

Chiefly because of varying characteristics the soils differ one from another in suitability for agriculture. Some are highly productive, easy to work, and easy to conserve and are therefore physically very well suited to crops. Others are low in productivity, difficult to work, and difficult to conserve and are unsuited or very poorly suited to crops or pasture. Most of the soils, however, are between these two extremes.

On the basis of differences in productivity, workability, and conservability, the soils are grouped in five classes: First-, Second-, Third-, Fourth-, and Fifth-class soils. Under ordinary systems of management common to the area, the First-, Second-, and Third-class soils are considered physically suitable for the production of

crops requiring tillage; the Fourth-class, unsuitable for or very poorly suited to the production of crops requiring tillage, but suitable for permanent pasture; and the Fifth-class, unsuitable for or very poorly suited to either crop or pasture production, but suitable for forestry.

On the basis of observation in this county it is apparent that the more progressive agricultural communities, as expressed by good farmhouses and other farm buildings, good fences, and ample farm equipment, are generally found where the soils are physically best suited to agriculture. Where First- and Second-class soils predominate, for example, the agriculture appears to be the most prosperous. In these areas the farmhouses appear as a rule to be well-built, the fences are generally well-built and well-maintained, and the farms are relatively well-equipped with modern machinery. These conditions are apparent in the Tennessee River bottoms. Where Third-, Fourth-, and Fifth-class soils predominate, the agriculture generally appears to be less prosperous.

SOIL SERIES AND THEIR RELATIONS

The soils differ so widely in such features as color, consistence, drainage, character of parent material, relief, and erosion, that they are classified in 94 units. Full use of the soil survey requires an understanding of the mapping units, designated as soil types or phases, and their relations to each other. These relations are more easily grasped if the soils are placed in groups based on their position in the landscape and on the source of their parent material. The soils of Benton County are placed in four main groups: (1) Soils of uplands; (2) soils of terrace lands; (3) soils of colluvial lands; and (4) soils of bottom lands. The soil series and their relation to each other are shown in table 4.

SOILS OF UPLANDS

The soils of uplands are on the higher lands above the stream valleys. They have developed from materials that are residual from the weathering of the underlying sedimentary rock, marine deposits, or loess; thus their properties are generally closely associated with the character of the underlying materials. In this county there are three easily recognizable classes or groups of such materials: (1) Loess (wind-blown silt); (2) Coastal Plain sand and clay (unconsolidated water deposits); and (3) cherty limestone. On the basis of differences in the kind of underlying material, the upland soils are placed in subgroups: (1) Soils derived from a thin silt mantle; (2) soils derived from Coastal Plain sand and clay; and (3) soils derived from cherty limestone.

SOILS DERIVED FROM A THIN SILT MANTLE

Soils derived from a thin silt mantle include those of the Dulac, Providence, Tippah, Lax, Mountview, Lexington, and Dickson series, all of which are moderately well-drained or well-drained and acid. All but the Mountview and Lexington have a siltpan at a depth of about 2 feet. The moderately well-drained soils of the group are characterized by a yellowish-gray silt loam surface soil, a brownish-yellow silty clay loam subsoil, and a siltpan just below the subsoil. The differences among the soil series are closely related to differences among the materials underlying the loess from which the soils are

TABLE 4.—*Characteristics of the soil series in Benton County*

SOILS OF UPLANDS

Geologic material and series	Parent material	Relief	Drainage
Loess (wind-blown silt): Lexington.....	Silt with sand below 24 to 42 inches. do.....	Hilly.....	Well drained.....
Providence.....	Silt with sandy clay below 24 to 42 inches. Silt with clay below 24 to 42 inches. Silt with gravel below 24 to 42 inches.	Undulating to rolling. do..... do..... do.....	Moderately well drained. ¹ do..... do..... do.....
Dulac.....	Silt with cherty limestone below 24 to 42 inches.	do.....	do.....
Tippah.....	Silt with cherty limestone below 10 to 24 inches.	Rolling to hilly.....	Well drained.....
Lax.....			
Dickson.....			
Mountview.....			
Coastal Plain sand and clay: Ruston..... Savannah.....	Mostly sand, some clay. do.....	Hilly to steep. Undulating to rolling. Rolling to steep. Hilly to steep.	do..... Moderately well drained. ¹ Well drained. Excessively drained. ²
Safford.....	Glauconitic sand and clay.		
Cuthbert.....	Sandy clay.....		
Shubuta.....	do.....	Rolling.....	Well drained.
Guin.....	Gravel.....	Rolling to steep.....	Excessively drained. ²
Cherty limestone: Bodine.....	Cherty limestone.....	Rolling to hilly.....	do.....

See footnotes at end of table.

TABLE 4.—*Characteristics of the soil series in Benton County, Tennessee*

SOILS OF TERRACE LANDS

Geologic material and series	Parent material	Relief	Drainage
Old general alluvium from loess and Coastal Plain material:			
Dexter-----	Loess and Coastal Plain sand and clay.	Undulating to rolling.	Well drained.-----
Freeland-----	do-----	do-----	Moderately well drained. ¹
Hatchie-----	do-----	Nearly level-----	Imperfectly drained. ³
Almo-----	do-----	do-----	Poorly drained. ⁴ -----
Old general alluvium from a variety of materials, including limestone:			
Paden-----	Silty alluvium, partly from limestone.	Undulating to rolling.	Moderately well drained. ¹
Taft-----	do-----	Nearly level-----	Imperfectly drained. ³
Robertsville-----	do-----	do-----	Poorly drained. ⁴ -----

Wolfcreek	do	Undulating	Moderately well drained. ¹
Sequestachie	Sandy alluvium affected by limestone.	do	Well drained.
Old general alluvium from cherty limestone material: Humphreys	Silty alluvium from cherty limestone.	do	do

SOILS OF COLLUVIAL LANDS

Local alluvium (local wash and some colluvial material): Briensburg	Silt from loess	Undulating	Imperfectly drained. Well drained
Alva	Sand, silt, and clay from loessal and Coastal Plain deposits.	do	
Eupora	do	do	Imperfectly drained. Well drained
Greendale	Silt and clay from cherty limestone.	Undulating to rolling.	

See footnotes at end of table.

TABLE 4.—*Characteristics of the soil series in Benton County, Tennessee*

SOILS OF BOTTOM LANDS

Geologic material and series	Parent material	Relief	Drainage
Recent general alluvium (stream bottoms): Shannon	Loess and Coastal Plain sand and clay.	Nearly level.	Well drained.
Hymon	do	do	Imperfectly drained.
Beechy	do	Nearly level.	Poorly drained.
Huntington	Mixed alluvium, partly from limestone.	do	Well drained.
Egam	do	do	do
Lindside	do	Nearly level.	Imperfectly drained.
Melvin	do	do	Poorly drained.
Bruno	Sandy alluvium affected by limestone.	do	Well drained.
Ennis	Silty alluvium from cherty limestone.	do	do
Lobelville	do	do	Imperfectly drained.

¹ Drainage retarded by siltpan; soil saturated for short periods within 12 inches of surface.² Indistinct profile; surface drainage rapid to very rapid, internal drainage slow to very rapid.³ Internal drainage retarded by siltpan or claypan; soil frequently saturated within 12 inches of surface.⁴ Internal drainage greatly retarded by siltpan or claypan; entire soil saturated much of the time.

developed. Although it is convenient to refer to these soils as having developed from a thin loessal mantle, usually 2 feet or less in thickness, the upper part of the underlying materials is in many places well within the zone of soil formation.

The well-drained Lexington and Mountview soils lack the siltpan. The Mountview soils have a cherty subsoil, whereas the Lexington are chert-free throughout the profile. The Lax soils are underlain by a cemented layer of gravel, and the Dickson by cherty limestone material. The Mountview soils differ from the Dickson chiefly in not having a siltpan. The Providence, Dulac, and Tippah soils are underlain by Coastal Plain sand and clay that differ under the different soils chiefly in texture and consistence and thereby in perviousness to water. The Providence soils are underlain by relatively pervious sandy materials; the Dulac, by semipervious sandy clay; and the Tippah, by relatively impervious clay. The siltpan varies in thickness and degree of compaction in the different soils, but the degree of compaction of the pan is not a differentiating characteristic except between the Dulac and the Providence.

SOILS DERIVED FROM COASTAL PLAIN SAND AND CLAY

The soils derived from Coastal Plain sand and clay include the Savannah, Ruston, Safford, Cuthbert, Shubuta, and Guin. They differ in many characteristics but are similar in having developed from unconsolidated sand or clay. All have a sandy surface soil, but the subsoil ranges from fine sandy clay loam to heavy clay. The differences among the soil series are closely related to differences in slope and in the materials from which they have developed. They are distinguished in the field chiefly by differences in color, consistence, and texture.

The Savannah soils are characterized by a yellowish-gray surface soil, a brownish-yellow subsoil, and a hardpan layer below the subsoil. These are distinguished from the Dulac, Providence, and Tippah soils by the surface layer, which is very fine sandy loam rather than silt loam. The differentiating characteristic of the Guin soils is the gravelly character of the surface soil and subsoil. The Ruston soils have a loose thick fine sandy loam or loamy fine sand surface soil and a very friable reddish-brown subsoil and substratum.

The Shubuta and Safford soils are similar in that they both have a moderately tough plastic clay subsoil, but they differ in the color, structure, and character of underlying material. The Safford soils have a reddish-brown subsoil, and the underlying sandy clay contains considerable green sand. The Shubuta has a yellowish-red subsoil, and the underlying sandy clay contains thin layers of bluish-gray clay. The Shubuta and Cuthbert are from similar parent material and differ chiefly in the degree of profile development. Both soils have a gray or grayish-yellow fine sandy loam surface soil; in the Cuthbert the surface soil is underlain by plastic clay mottled with red, yellow, and gray. The Cuthbert soils are on ridge slopes, whereas the Shubuta is on ridge crests in most places.

SOILS DERIVED FROM CHERTY LIMESTONE

The shallow soils of the Bodine series are derived from cherty limestone. They have a very weakly developed textural profile and are

readily identified by the large number of angular chert fragments on the surface and throughout the profile. The soils are on relatively steep ridge slopes in most places.

SOILS OF TERRACE LANDS

In the geologic past the present rivers and streams flowed at considerably higher levels, and at these levels they deposited gravel, sand, and clay on their flood plains. During the progress of stream cutting over a great number of years, the channels were gradually deepened, new flood plains were formed at the lower levels, but remnants of the older higher lying flood plains were left. These areas are now above the overflow stage of the present streams and constitute what is referred to as terrace land, old general stream alluvium, second bottoms, or benches. The soils of this group are divided into three subgroups on the basis of differences in the origin of parent material: (1) Soils derived from old general alluvium from loess and Coastal Plain material; (2) soils derived from old general alluvium from a variety of materials, including limestone; and (3) soils derived from old general alluvium from cherty limestone material.

SOILS DERIVED FROM OLD GENERAL ALLUVIUM FROM LOESS AND COASTAL PLAIN MATERIAL

Soils derived from old general alluvium from loess and Coastal Plain material include members of the Dexter, Freeland, Hatchie, and Almo series. These soils are chiefly on the high terraces of the larger streams in the sandy Coastal Plain and loessal sections of the county. They have formed from old mixed alluvium washed from uplands underlain by wind-blown silt and unconsolidated sand and clay. Their differences in characteristics are due chiefly to differences in drainage. The well-drained Dexter soils are easily identified by the reddish-brown subsoil. The moderately well-drained Freeland soils have a brownish-yellow or yellowish-brown subsoil and a siltpan at a depth of about 2 feet. The imperfectly drained Hatchie soil has a pale-yellow subsoil and a strongly developed siltpan. The poorly drained Almo soil is predominantly light gray throughout the profile.

SOILS DERIVED FROM OLD GENERAL ALLUVIUM FROM A VARIETY OF MATERIALS, INCLUDING LIMESTONE

Soils derived from old general alluvium from a variety of materials, including limestone, are members of the Paden, Taft, Robertsville, Sequatchie, and Wolftever series. The old alluvium has washed from uplands underlain by a wide variety of rock, including shale, sandstone, limestone, loess, and Coastal Plain sand and clay. Limestone material is thought to be sufficient to affect the alluvium considerably.

The Paden, Taft, and Robertsville soils are along the Tennessee River on high terraces that may be covered in places with a thin layer of loess. The moderately well-drained Paden soils have a yellowish-brown or a brownish-yellow subsoil and a siltpan at a depth of about 2 feet. The imperfectly drained Taft soil has a pale-yellow subsoil and a strongly developed siltpan. The poorly drained Robertsville soil is predominantly light gray throughout.

The Taft and Robertsville soils are also in association with Wolftever and Sequatchie soils of the low Tennessee River terraces. The Sequatchie and Wolftever soils lie on the younger and lower terraces and are subject to overflow by extremely high waters. The Sequatchie soil is sandy, brown, and very well drained; whereas the Wolftever soils have a silt loam surface soil and a compact yellowish-brown or brownish-yellow subsoil and are only moderately well drained.

SOILS DERIVED FROM OLD GENERAL ALLUVIUM FROM CHERTY LIMESTONE MATERIAL

Soils derived from old general alluvium from cherty limestone material include the members of the Humphreys series and occupy low terraces along the streams in the cherty limestone hill section. The alluvium has washed chiefly from uplands underlain by cherty limestone. The soils are characterized by chert fragments in the profile, although the silt loam type has a relatively chert-free surface soil. The brown well-drained Humphreys soils occur in association with Ennis soils of the first bottoms. The poorly drained and imperfectly drained soils of terrace lands associated with the Humphreys soils are included in the Robertsville and Taft series.

SOILS OF COLLUVIAL LANDS

The soils of colluvial lands are on sloping fans and benches at the base of slopes, particularly of the longer slopes on which erosion has been active. The parent material is derived from soil material and rock fragments washed and rolled from the adjacent slopes. Three subgroups based on differences in the general character of the parent material are recognized: (1) Soils derived from colluvium from loessal material; (2) soils derived from colluvium from loess and Coastal Plain material; and (3) soils derived from colluvium from cherty limestone material.

SOILS DERIVED FROM COLLUVIUM FROM LOESSAL MATERIAL

The parent material of the Briensburg soil has washed from soils of uplands—the Dulac, Providence, and Paden soils—developed from loess. Like the Alva and Eupora soils, it is on gently sloping areas of good surface drainage. The Briensburg soil is similar to the Eupora in drainage. It has a grayish-brown surface soil but is mottled below 10 to 18 inches.

SOILS DERIVED FROM COLLUVIUM FROM LOESS AND COASTAL PLAIN MATERIAL

Soils from colluvium from loess and Coastal Plain material include members of the Alva and Eupora series. The parent material of these soils consists of mixed local alluvium or colluvium washed from uplands underlain by loess and Coastal Plain sand and clay. The Alva soil is brown, friable, and well drained and differs from the Briensburg chiefly in having a fine sandy loam texture and in being well drained. The Eupora soil is imperfectly drained. It has a grayish-brown surface soil but is highly mottled below 10 to 18 inches, and differs from the Briensburg chiefly in its fine sandy loam rather than silt loam texture. The soils are associated chiefly with the Savannah, Ruston, Safford, and Cuthbert soils of the uplands.

SOILS DERIVED FROM COLLUVIUM FROM CHERTY LIMESTONE MATERIAL

Soils derived from colluvium from cherty limestone material are of the Greendale series. The parent material of these soils has washed from adjacent slopes underlain by cherty limestone. The Greendale soils are along small drainageways, at the base of upland slopes, and on small, sloping, alluvial-colluvial fans, where the small streams have deposited their load over the broad flood plains of larger streams. They are grayish-brown well-drained young soils characterized by numerous chert fragments on the surface and throughout the profile.

SOILS OF BOTTOM LANDS

Bottom land means the flood plains, or the nearly level areas along streams that are subject to floods. The material giving rise to the soils in the bottom lands has been carried there by the streams, and its character depends largely on the source in the higher lying lands and the rate at which water was moving when the material was deposited. The soils in the bottoms are recently formed. The material from which they are developing has not lain in place long enough for well-defined surface soil and subsoil layers to develop as are found in most of the soils of uplands and terraces.

On the basis of differences in parent material, soils of the bottom lands are divided into four subgroups: (1) Soils derived from recent alluvium from loess and Coastal Plain material; (2) soils derived from recent alluvium from a wide variety of materials, including limestone; (3) soils derived from recent alluvium from sandstone or Coastal Plain sand; and (4) soils derived from recent alluvium from cherty limestone material.

SOILS DERIVED FROM RECENT ALLUVIUM FROM LOESS AND COASTAL PLAIN MATERIAL

Soils derived from recent alluvium from loess and Coastal plain sand and clay material are members of the Shannon, Hymon, and Beechy series. These soils occupy first bottoms along streams in the sandy Coastal Plain and loessal plain sections of the county. The well-drained Shannon soils are brown and free of mottlings to a depth of 20 inches or more. The imperfectly drained Hymon soils have a grayish-brown surface layer but are mottled below about 10 inches. The poorly drained Beechy soils are predominantly gray throughout the profile.

SOILS DERIVED FROM RECENT ALLUVIUM FROM A WIDE VARIETY OF MATERIALS, INCLUDING LIMESTONE

The soils derived from recent alluvium from limestone and other materials—Huntington, Egam, Lindside, and Melvin series—have washed to the flood plains of the Tennessee River from uplands underlain by a wide variety of rocks. The Huntington soil is brown, friable, and well drained and is chiefly on low first bottoms; the Egam soil is dark grayish brown, compact, moderately well drained, and is chiefly on high first bottoms; the Lindside soils are imperfectly drained; and the Melvin soil is poorly drained.

SOILS DERIVED FROM RECENT ALLUVIUM FROM SANDSTONE OR COASTAL PLAIN SAND

Only the soils of the Bruno series are included in the group of soils derived from recent alluvium from sandstone or Coastal Plain sand. They have washed from uplands underlain by a variety of rock, but are predominantly of material from the Coastal Plain sand and sandstone. These soils are on the Tennessee River first bottoms and are characterized by an extremely sandy texture. In most places they are on natural levees.

SOILS DERIVED FROM RECENT ALLUVIUM FROM CHERTY LIMESTONE MATERIAL

Soils derived from recent alluvium from cherty limestone material are members of the Ennis and Lobelville series. They consist of material washed mostly from cherty Bodine soils and deposited on the flood plains of streams in the cherty limestone hill section. The Ennis soils are light-brown well-drained soils characterized by varying quantities of chert fragments on the surface and throughout the profile. The Lobelville soil is grayish brown or light brown, imperfectly drained, and mottled below a depth of about 12 inches.

SOIL TYPES AND PHASES

The soils of the county are described in detail and their agricultural relations, including present use and management, use suitability, and management requirements, are discussed. Included are three miscellaneous land types—Hilly stony land (Talbot and Colbert soil materials), Rough gullied land (Cuthbert soil material), and Rough gullied land (Ruston soil material). The location and distribution of all are shown on the accompanying soil map, and the acreage and proportionate extent in table 5.

TABLE 5.—*Acreage and proportionate extent of the soils in Benton County, Tenn.*

Soil	Acres	Per-cent	Soil	Acres	Per-cent
Almo silt loam.....	603	0.2	Cuthbert fine sandy loam:		
Alva fine sandy loam...	322	.1	Hilly phase.....	7,725	3.2
Beechy fine sandy loam...	4,931	2.0	Steep phase.....	471	.2
Beechy silt loam.....	17,374	3.0	Dexter silt loam:		
Bodine cherty silt loam:			Eroded rolling phase...	323	.1
Eroded hilly phase....	427	.2	Eroded undulating phase.....	264	.1
Hilly phase.....	13,680	5.6	Dickson silt loam:		
Rolling phase.....	4,957	2.0	Eroded rolling phase...	4,760	2.0
Severely eroded hilly phase.....	629	.3	Eroded undulating phase.....	3,287	1.4
Steep phase.....	31,819	13.0	Rolling phase.....	8,174	3.4
Briensburg silt loam...	9,961	4.1	Undulating phase.....	1,779	.7
Bruno fine sandy loam...	(¹)		Dickson silty clay loam,		
Bruno loamy fine sand...	11	(²)	severely eroded rolling phase.....	2,613	1.1
Cuthbert clay loam:					
Eroded hilly phase....	285	.1			
Severely eroded hilly phase.....	2,279	.9			

See footnotes at end of table.

TABLE 5.—*Acreage and proportionate extent of the soils in Benton County, Tenn.—Continued*

Soil	Acres	Per-cent	Soil	Acres	Per-cent
Dulac silt loam:			Lobelville silt loam	3,561	1.5
Eroded rolling phase	8,032	3.3	Melvin silt loam	2,301	.9
Eroded undulating phase	5,972	2.4	Mountview silt loam:		
Rolling phase	10,738	4.4	Eroded hilly shallow phase	942	.4
Undulating phase	2,441	1.0	Eroded rolling shallow phase	2,136	.9
Dulac silty clay loam, severely eroded rolling phase	8,010	3.3	Hilly shallow phase	7,685	3.1
Egam silty clay loam	11	(²)	Rolling shallow phase	8,996	3.7
Ennis cherty silt loam	1,819	.7	Mountview silty clay loam, severely eroded rolling shallow phase	833	.3
Ennis silt loam	2,609	1.1	Paden silt loam:		
Eupora fine sandy loam	2,465	1.0	Eroded rolling phase	351	.1
Freeland clay loam, severely eroded rolling phase	526	.2	Undulating phase	253	.1
Freeland silt loam:			Pits and Quarries	98	(²)
Eroded rolling phase	1,085	.4	Providence silt loam:		
Eroded undulating phase	2,027	.8	Eroded rolling phase	1,961	.8
Rolling phase	213	.1	Eroded undulating phase	636	.3
Undulating phase	603	.2	Rolling phase	2,849	1.2
Greendale cherty silt loam:			Undulating phase	98	(²)
Rolling phase	866	.4	Providence silty clay loam, severely eroded rolling phase	1,593	.6
Undulating phase	8,087	3.3	Robertsville silt loam	252	.1
Guin gravelly loam:			Rough gullied land:		
Hilly phase	1,382	.6	Cuthbert soil material	526	.2
Rolling phase	252	.1	Ruston soil material	614	.3
Steep phase	822	.3	Ruston fine sandy loam:		
Hatchie silt loam	2,268	.9	Eroded hilly phase	647	.3
Hilly stony land (Talbott and Colbert soil materials)	93	(²)	Hilly phase	10,223	4.2
Humphreys cherty silt loam	986	.4	Steep phase	822	.3
Humphreys silt loam	2,125	.9	Ruston sandy clay loam, severely eroded hilly phase	3,025	1.2
Huntington silt loam	28	(²)	Safford clay loam:		
Hymon fine sandy loam	1,753	.7	Eroded hilly phase	109	(²)
Hymon silt loam	3,912	1.6	Eroded rolling phase	185	.1
Lax silt loam:			Severely eroded hilly phase	515	.2
Eroded rolling phase	355	.1	Safford very fine sandy loam:		
Eroded undulating phase	241	.1	Hilly phase	2,082	.9
Rolling phase	1,496	.6	Rolling phase	131	.1
Lax silty clay loam, severely eroded rolling phase	220	.1	Steep phase	114	(²)
Lexington-Ruston complex:			Savannah clay loam, severely eroded rolling phase	2,487	1.0
Hilly phases	899	.4	Savannah very fine sandy loam:		
Severely eroded hilly phases	303	.1	Eroded rolling phase	2,039	.8
Lindside silt loam	185	.1	Rolling phase	5,754	2.4
Lindside silty clay loam	11	(²)			

See footnotes at end of table.

TABLE 5.—*Acreage and proportionate extent of the soils in Benton County, Tenn.—Continued*

Soil	Acres	Per-cent	Soil	Acres	Per-cent
Sequatchie fine sandy loam-----	1 54	(²)	Taft silt loam-----	1 975	. 4
Shannon fine sandy loam-----	1 252	. 1	Tippah silt loam, eroded rolling phase--	235	. 1
Shannon silt loam-----	1 85	(²)	Wolftever silt loam-----	1 53	(²)
Shubuta fine sandy loam, rolling phase---	244	. 1	Wolftever silty clay loam, eroded phase---	1 23	(²)
			Total-----	245, 248	100. 0

¹ Not included in acreages of soils in the county but shown on the map are 30,656 acres covered by the Kentucky Reservoir since mapping was completed. The acreage covered by water is distributed as follows:

Acres	Acres
Beechy silt loam-----	2, 743
Bruno fine sandy loam (entire acreage)-----	1, 049
Bruno loamv fine sand-----	415
Egam silty clay loam-----	1, 421
Ennis silt loam-----	1, 060
Greendale cherty silt loam, rolling phase---	120
Greendale cherty silt loam, undulating phase-----	393
Humphreys silt loam-----	514
Huntington silt loam-----	890
Hymon fine sandy loam-----	87
Hymon silt loam-----	787
Lindside silt loam-----	1, 640
Lindside silty clay loam-----	186
Lobelville silt loam-----	1, 530
Melvin silt loam-----	5, 943
Robertsville silt loam-----	1, 170
Sequatchie fine sandy loam-----	1, 159
Shannon fine sandy loam-----	175
Shannon silt loam-----	300
Taft silt loam-----	3, 794
Wolftever silt loam-----	3, 170
Wolftever silty clay loam, eroded phase---	2, 110

² Less than 0.1 percent.

Almo silt loam.—This is a gray poorly drained soil locally referred to as crayfish land and white cold-natured land. It is on slopes of 1 to 3 percent on terraces along the larger streams flowing from the sandy Coastal Plain and the loessal plain sections of the county. The mixed alluvium from which the soil is formed has washed from soils of uplands underlain by unconsolidated silt, sand, and clay. The native vegetation was water-tolerant trees, as willow oak, shingle oak, sweetgum, black tupelo, birch, and willow.

The soil is in small irregularly shaped areas of 1 to 10 acres on most of the terraces in the Coastal Plain section, but the largest acreage is on the broad high terraces along the Big Sandy River and Birdsong and Rushing Creeks. It is closely associated with Hatchie and Freeland soils. On most broad terraces it is on nearly level or slightly depressed areas surrounded by Hatchie soils. A considerable acreage, however, is in narrow belts at the foot of adjacent upland slopes. The poor drainage of the soil in this position is partly due to seepage from the upland slopes.

In most places the soil profile is free of stone or gravel. Numerous small concretions are throughout the profile, but the greatest con-

centration is in the siltpan. The soil is very strongly acid and apparently low in organic matter and essential mineral plant nutrients. Both external and internal drainage are very slow. The surface soil and subsoil layers are moderately permeable, but the siltpan is relatively impermeable to roots, moisture, and air. The soil has a low water-holding capacity, owing chiefly to the shallow depth to the impermeable siltpan layer.

Following is a profile description :

- 0 to 10 inches, gray or light-gray mellow silt loam splotted with light gray or rust brown; 8 to 12 inches thick.
- 10 to 20 inches, friable silty clay loam highly mottled with gray, yellow, and brown; 8 to 14 inches thick.
- 20 to 44 inches, siltpan of light-gray or bluish-gray compact silty clay loam; 20 to 30 inches thick.
- 44 inches +, moderately friable mixed alluvium mottled with gray, yellow, and brown, ranging from silty clay loam or sandy clay loam to stratified layers of sand and silt.

Present use and management.—Almo silt loam is used and managed like the associated Hatchie and Freeland soils chiefly because of its small irregular areas. Some is used for pasture or hay, but most of it for crops, mainly corn and cotton. The yield of all crops is low, and complete failure of row crops is common. Moderate yields of low quality pasture are obtained.

Use and management requirements.—Almo silt loam is not considered well suited to common field crops, chiefly because of poor drainage. Artificial drainage would be expected to broaden the use suitability, but the soil is difficult to drain because of the manner of occurrence, the compact siltpan, and seepage in some places from the adjacent slopes. The soil is low in available plant nutrients and water-holding capacity; consequently, crop yields are low even on drained areas. It is probably best used for pasture, but applications of lime, phosphate, and potash are needed. With better fertilization, good quality pasture plants, as white clover, lespedeza, orchard grass, redtop, and Bermuda grass are grown successfully.

Alva fine sandy loam.—This well-drained young soil formed from local alluvium or colluvium at the foot of the slopes from which the material was washed. The mixed alluvium is from soils of the uplands derived from wind-blown silt and unconsolidated Coastal Plain sand and clay. The soil is in small areas on gently sloping alluvial fans of small streams emerging onto larger flood plains, gently sloping colluvial areas at the base of steep slopes, or along narrow drainageways. It is widely distributed throughout the western part of the county in association chiefly with Eupora soils of the colluvial lands, Shannon soils of the bottom lands, and Ruston soils of the uplands. The deciduous forest vegetation consisted chiefly of white and red oaks, beech, maple, and sweetgum.

The soil is very permeable throughout the profile. It usually has a high water-holding capacity, but in places the capillary movement of the moisture is broken by excessively sandy layers. External and internal drainage are moderate. Only the soil along the small streams is subject to overflow and then only for short periods. The soil is strongly to very strongly acid and relatively high in organic matter and plant nutrients.

Following is a profile description:

- 0 to 12 inches, light-brown or grayish-brown loose fine sandy loam; the upper 2 or 3 inches in wooded areas stained dark gray with organic matter; 8 to 14 inches thick.
- 12 to 36 inches, light-brown or yellowish-brown friable fine sandy loam; some gray splotches below 18 to 24 inches; 12 to 24 inches thick.
- 36 inches +, light-gray sandy alluvium splotched with gray; 0 to 4 feet thick.

Variations occur in texture, depth of colluvial deposit, and drainage. In most places the surface layer is fine sandy loam and the lower part of the profile varies from silt loam to loamy fine sand. The depth of the colluvial deposit ranges from about 2 to 10 feet. The depth to the mottled zone may be as little as 18 inches, but in most places it is 24 inches or more. Small areas of nearly level Shannon soils along the small drains are included with this separation. These inclusions and variations do not differ significantly in use and management from Alva fine sandy loam.

Present use and management.—Practically all of Alva fine sandy loam is cleared and used for crop production—about 60 percent for corn, 15 percent for cotton, and 15 percent for miscellaneous crops—and 10 percent is in woodland or idle open land. Crops are not systematically rotated, and the use of fertilizer is not common. Fair yields of corn and cotton are obtained under continuous cropping. Farmers use a 200-pound application of 20-percent superphosphate or a 4-10-4 mixture under cotton. Corn yields about 30 bushels an acre, and cotton, about 280 pounds.

Use and management requirements.—Alva fine sandy loam is one of the more productive soils of the county and is suited to a wide variety of crops. It is well drained and fertile, has good moisture relations, and can be tilled over a wide range of moisture conditions. In most places it is suited to intensive use and can be maintained in a 3- or 4-year rotation that includes a legume, preferably a deep-rooted one. Lime is needed for the legume crop, and phosphate for all crops. Applications of potash may improve crop yields, especially after the removal of several legume hay crops. Nitrogen fertilizer may be needed for all except the legume crop and the crops immediately following, especially if a long rotation is used. Average acre yields under good management practices are 45 bushels of corn, 420 pounds of cotton, and 1.6 tons of lespezeza hay.

Beechy silt loam.—This is a young light-colored poorly drained soil of the first bottoms (pl. 2, A). Because of abundant crayfish chimneys the soil is locally referred to as crayfish land. The material from which the soil has formed consists of mixed general alluvium washed from soils of the uplands, which were derived from wind-blown silt and Coastal Plain sand and clay. The slope does not exceed 3 percent. The deciduous forest vegetation consisted chiefly of water-loving oaks, sweetgum, black tupelo, beech, birch, and willow.

Areas are widely distributed throughout the sandy Coastal Plain and loessal plain sections, where it is the most extensive soil on the flood plains of most of the streams. It is also the most extensive soil on the flood plain of the Big Sandy River and is in relatively large areas associated chiefly with Hymon, Eupora, and Briensburg soils.

After it was mapped, an area of 2,743 acres was covered by water of the Kentucky Reservoir.

The surface drainage is very slow, and most of the soil is subject to periodic overflow. The soil is permeable, but the water table is at or near the surface much of the time. It is strongly to very strongly acid and apparently moderately high in organic matter and mineral plant nutrients.

Following is a profile description:

0 to 5 inches, brownish-gray mellow silt loam spotted with gray and rust brown or light gray; 0 to 10 inches thick.

5 to 35 inches, friable silt loam or heavy silt loam mottled with gray, rust brown, or brown; 15 to 30 inches thick.

35 inches +, mixed alluvium of fine sandy loam or silt loam; stratified layers of silt and sand in places; 2 to 10 feet thick or more.

A few small areas that are permanently swampy are included. Also included are small areas of Beechy fine sandy loam and Hyman silt loam chiefly because of their small size and the intricate pattern they form with this soil. These variations, however, do not differ significantly in use and management from the soil described.

Present use and management.—About 40 percent of Beechy silt loam is cleared; of the cleared area about 20 percent is used for corn, 25 percent for miscellaneous crops, 30 percent for hay and pasture, and about 25 percent is idle. Fertilization or rotation of crops is not commonly practiced. Some areas have been drained by open ditches, but no tile drainage has been attempted. Hay yields are fairly consistent, but the yield of corn is highly variable. In dry seasons yields of corn are good but in wet seasons total failures are common. Good plant growth is obtained on the pastures, but the quality is generally low.

Use and management requirements.—In its present poorly drained condition Beechy silt loam is poorly suited to row crops but well-suited to pasture and certain hay crops (pl. 2, B). With adequate artificial drainage corn can be successfully grown, although the flood hazard cannot be entirely eliminated. Applications of lime and phosphate make it possible to produce excellent pastures. Hay and pasture plants grown successfully are white clover, alsike clover, lespedeza, orchard grass, redtop, and Bermuda grass. Most of the areas will respond to artificial drainage, but such improvement may be too expensive.

Beechy fine sandy loam.—This poorly drained soil of the first bottoms is on slopes that do not exceed 3 percent. It is formed from mixed alluvium washed from upland soils derived from wind-blown silt and Coastal Plain sand and clay. It differs from Beechy silt loam chiefly in containing a higher proportion of sandy material. The deciduous forest vegetation consisted chiefly of water-tolerant trees.

The soil is usually in close association with Hyman, Briensburg, and Eupora soils, and Beechy silt loam. It occurs chiefly on the narrow flood plains in the highly dissected areas where Ruston soils are in the uplands but also in long narrow areas along the stream in the broad first bottoms. It is a young soil without well-developed textural horizons and is less extensive than Beechy silt loam.

Surface drainage is very slow, and most areas are susceptible to overflow. The soil is permeable throughout, but the water table is

at or near the surface most of the year. It is strongly to very strongly acid and moderately high in organic matter and plant nutrients.

Following is a profile description:

- 0 to 8 inches, brownish-gray or light-gray loose fine sandy loam splotted with light gray and rust brown; 4 to 10 inches thick.
- 8 to 30 inches, very friable fine sandy loam mottled with gray, rust brown, and light brown; 15 to 30 inches thick.
- 30 inches +, highly mottled sandy alluvium, stratified in many places; 2 to 10 feet thick.

The poor drainage of a part of the soil included with this type is caused by seepage from the adjacent upland slopes. These areas usually have fair surface drainage and are better suited to crop production than the areas having very slow surface drainage.

Present use and management.—About 60 percent of Beechy fine sandy loam has been cleared. The proportion cleared is considerably larger than for Beechy silt loam. About 35 percent of the cleared area is used for corn production, 30 percent for hay or pasture, 20 percent for sorghum and other miscellaneous crops, and about 15 percent is idle. Crop yields are somewhat less variable than for Beechy silt loam but not so high in favorable seasons.

Use and management requirements.—Under the present drainage conditions hay or pasture production is probably the best use for Beechy fine sandy loam. Most of the areas have a wider use suitability if artificially drained, but the expense of draining may not be justified. Artificial drainage, however, does not eliminate the overflow hazard. Corn can be successfully grown on drained areas, but an occasional crop is lost because of flooding. Good to excellent hay and pasture crops can be produced. Applications of lime and phosphate are needed to establish and maintain pastures or meadows, and potash also is needed on some areas. Among the hay and pasture plants that can be successfully grown are white clover, alsike clover, lespedeza, redtop, orchard grass, and Bermuda grass.

Bodine cherty silt loam, hilly phase.—One of the more extensive soils of the county and widely distributed throughout the cherty limestone hill section. It is an excessively drained soil developed from the residuum of cherty limestone on slopes of 12 to 25 percent. On the slopes of the narrow winding ridges it is associated with the Dickson, Greendale, Humphreys, and Ennis soils. The post and blackjack oaks common on the upper slopes are replaced by white and red oaks and hickory on the lower slopes.

The soil is strongly to very strongly acid and low in fertility and organic matter. It has a large number of angular chert fragments on the surface and throughout the profile. It is very permeable to air, roots, and moisture. Both external and internal drainage are rapid, and the water-holding capacity is low.

This is a shallow weakly developed soil and varies considerably in profile characteristics.

Following is a typical profile description:

- 0 to 8 inches, brownish-gray cherty silt loam; 5 to 12 inches thick.
- 8 to 18 inches, brownish-yellow friable cherty silt loam or cherty silty clay loam; 0 to 18 inches thick.
- 18 inches +, very cherty silty clay loam mottled with red, yellow, gray, and brown; 5 feet or more thick.

Many variations occur within short distances, especially in the degree of development of surface and subsoil layers. In many places, especially at the foot of slopes where some colluvial material has accumulated, the surface layer is 15 inches thick. Small areas also are included that have a moderately well-developed textural profile. The number of chert fragments in the soil varies considerably, but in most places they are sufficient to interfere materially with cultivation. In many places the parent material includes a small quantity of wind-blown silt that somewhat influences the texture of the surface soil.

Present use and management.—Practically all of Bodine cherty silt loam, hilly phase, is in forest. All areas have been cut-over many times, and at present the stand includes little marketable timber. Most areas have been burned over frequently, and many of them are grazed.

Use and management requirements.—Chiefly because of low fertility, low water-holding capacity, chertiness, and strong slopes, Bodine cherty silt loam, hilly phase, is very poorly suited to crops requiring tillage. Though naturally unsuitable for pasture, fair pastures can be established and maintained under good management (pl. 2, C). The management program should include applications of lime and phosphate and some phosphate each year. As the carrying capacity of the pasture is low, the expense of clearing the forest and establishing the pasture may not be justified. Many areas are probably best left in forest. Management is concerned chiefly with increasing the yield and quality of timber.

Bodine cherty silt loam, eroded hilly phase.—This is an excessively drained shallow soil characterized by a high content of angular chert fragments on the surface and throughout the profile. It has developed on slopes of 12 to 25 percent and differs from the hilly phase chiefly in being eroded. The parent material consists of the residuum from very cherty limestone. The forest vegetation was deciduous. The comparatively small areas are scattered throughout the cherty limestone hill section on ridge slopes, associated chiefly with Dickson soils of the uplands, Greendale soils of the colluvial lands, Humphreys soils of the low terraces, and Ennis soils of the bottom lands.

The soil has eroded unevenly, and the depth of the surface layer varies greatly. In some places so much of the original surface soil has been lost that the subsoil is incorporated in the surface layer by tillage implements and imparts a yellowish color to it. Chert fragments have accumulated on the surface, and the soil appears to contain more chert than the uneroded type. The plow layer contains enough chert to interfere materially with tillage. The soil is strongly to very strongly acid, low in water-holding capacity, and low in organic matter and plant nutrients.

Following is a profile description:

- 0 to 6 inches, brownish-gray to yellowish-gray friable cherty silt loam; 0 to 10 inches thick.
- 6 to 16 inches, brownish-yellow or yellowish-brown friable cherty silt loam or cherty silty clay loam; 0 to 18 inches thick.
- 16 inches +, very cherty silty clay loam mottled with red, yellow, gray, and brown; 5 feet thick or more.

Within short distances variations occur in degree of textural development and in thickness of surface and subsoil layers. The thickness of the surface soil is also variable because of accelerated erosion. The

chertiness of the plow layer varies somewhat, but in practically all places it is sufficient to interfere materially with tillage. Management of these variations is not appreciably different.

Present use and management.—All of Bodine cherty silt loam, eroded hilly phase, has been cleared and used for field crops. Most of it is idle or wasteland at present, although some is used for pasture. Neither fertilization nor crop rotation is commonly practiced. In most places the soil is cleared and cultivated in row crops until yields become very low and is then either abandoned or used as unimproved pasture. The yields of both crops and pasture are very low under common management practices.

Use and management requirements.—The eroded hilly phase of Bodine cherty silt loam is very poorly suited to the production of in-tillaged field crops. Though not naturally productive of pasture plants it may be used for pasture, but will need applications of lime and phosphate for its establishment and maintenance. Even under good management pasture yields are usually low. The growth of the pasture plants is greatly retarded during the dry summer and fall months chiefly because of the low water-holding capacity of the soil.

Bodine cherty silt loam, severely eroded hilly phase.—Because of erosion this soil has lost most of the original surface layer and, in places, part of the subsoil. It is on ridge slopes that have a gradient of 12 to 25 percent. Shallow gullies and exposures of subsoil are common and conspicuous. The soil has developed from the residuum of cherty limestone and is cherty throughout the profile. An accumulation of chert is on the surface, owing to the removal of the finer particles by erosion. In small areas this phase is widely distributed throughout the cherty limestone hill section of the county. It is associated with Dickson, Greendale, Humphreys, Ennis, and other Bodine soils.

The soil is strongly to very strongly acid, very low in organic matter and plant nutrients, and very low in water-holding capacity. Both external and internal drainage are rapid.

The surface layer is highly variable in color and thickness as a result of the uneven loss of soil and the mixing of the subsoil with the remnants of the surface soil.

Following is a profile description:

- 0 to 6 inches, brownish-gray to grayish-yellow friable very cherty silt loam; 0 to 8 inches thick.
- 6 to 16 inches, brownish-yellow or yellowish-brown friable cherty silt loam or cherty silty clay loam; 0 to 18 inches thick.
- 16 inches +, cherty silty clay loam mottled with red, yellow, gray, and brown; 5 feet thick.

Some of the soil included in this separation contains less chert than is typical; remnants of the original surface soil are relatively chert-free, although most of this layer has been removed by erosion.

Present use and management.—All of the severely eroded hilly phase of Bodine cherty silt loam has been cleared and used for crops and pasture. Most of it is now temporarily idle or abandoned. A few areas are in unimproved pasture, but the yield is low.

Use and management requirements.—Bodine cherty silt loam, severely eroded hilly phase, is poorly suited to crop production and pasture. In its present condition it is probably best suited to forestry.

Reforestation is difficult and probably requires advance preparation, as contour furrows, check dams, mulching, diversion ditches, and fertilization. After such preparation shortleaf and loblolly pines make a fair growth, and black locusts grow well in the fill behind the check dams.

Bodine cherty silt loam, steep phase.—This soil differs from the hilly phase mainly in having a steeper slope (25 to 60 percent). Like that phase it has formed from the residuum of highly cherty limestone but it is usually more variable, especially in the thickness of the surface and subsoil layers. The native forest vegetation was deciduous. This is one of the most extensive soils in the county and occurs in large areas throughout the cherty limestone hill section, associated chiefly with other Bodine soils.

The soil is very permeable, and both internal and external drainage are rapid to very rapid. Considerable chert is on the surface and throughout the profile, the fragments 1 to 3 inches in diameter and, in most places, sharply angular. The soil is apparently low in organic matter, plant nutrients, and water-holding capacity.

This phase has even more poorly defined surface and subsoil layers than the hilly phase.

Following is a profile description:

0 to 8 inches, brownish-gray friable cherty silt loam; 6 to 12 inches thick.

8 to 16 inches, brownish-yellow or brownish-gray friable cherty silt loam; 0 to 15 inches thick.

16 inches +, very cherty silty clay loam mottled with red, yellow, gray, and brown; 5 feet or more thick.

Present use and management.—Practically all of Bodine cherty silt loam, steep phase, is in forest. Some small areas, adjacent to open cropland and pasture land are cleared and used for pasture, but the yields are very low even under good management.

Use and management requirements.—Chiefly because of steep slopes, chertiness, low fertility, and low water-holding capacity, Bodine cherty silt loam, steep phase, is apparently not suited to growing crops that require tillage, and it is also poorly suited to pasture. It is probably best suited to forestry, but on some farms it may be necessary to use it for pasture. The north- and east-facing slopes are apparently more productive of pasture than the south- and west-facing slopes, and the lower slopes are generally more productive than the upper ones. Liberal applications of lime, phosphate, and possibly potash are needed to establish and maintain fair pasture.

Bodine cherty silt loam, rolling phase.—This is a cherty soil on narrow crests of high ridges in the highly dissected cherty limestone hill section. The soil occurs in long winding areas in association mainly with other Bodine soils. It has developed from the residuum of cherty limestone on 5- to 12-percent slopes. The deciduous forest vegetation consists chiefly of post and blackjack oaks.

This soil is cherty throughout the profile and contains enough chert in the plow layer to interfere materially with tillage. It is very permeable, and internal drainage is rapid and external drainage moderate. The soil is apparently low in organic matter, plant nutrients, and water-holding capacity and is strongly to very strongly acid.

Following is a profile description :

- 0 to 8 inches, brownish-gray friable cherty silt loam ; 6 to 10 inches thick.
- 8 to 20 inches, brownish-yellow light cherty silty clay loam ; 10 to 20 inches thick.
- 20 inches+, cherty silty clay loam mottled with gray, red, yellow, and brown ; 10 feet thick or more.

Some small areas are included that have well-developed surface and subsoil layers, but because of their small size they were not separated. The soils of this inclusion are similar to the Nixa soils in nearby counties. A few small areas of Mountview soils also are included that differ chiefly in being less cherty in the plow layers.

Present use and management.—Practically all areas of Bodine cherty silt loam, rolling phase, are still in forests that have been cut over a number of times. Very little marketable timber is left and that is of poor quality and grows very slowly. Most of the forests have been burned over every few years, and many are grazed by cattle.

Use and management requirements.—Chiefly because of chertiness, low fertility, and low water-holding capacity, Bodine cherty silt loam, rolling phase, is poorly suited to crops, and it also has a very unfavorable distribution for crop production. It is on narrow winding ridges in association with steep and hilly Bodine soils that are not suited to cultivation. Access to many areas is difficult, and the fields are very irregular in shape. Under good management, which includes adequate fertilization and a careful selection of crops, fair yields can be expected. Lime, phosphate, and possibly potash are needed for practically all crops. Nitrogen fertilizer is needed for all crops except legumes and those immediately following legumes. Selection should be made of drought-resistant crops that grow on soils of low water-holding capacity or of crops that mature in the season of high rainfall.

This soil is probably physically better suited to pasture than to crop production. Good pasture can be established and maintained with heavy applications of lime and phosphate. As the soil dries out rapidly after rains, especially in hot weather, the productivity of pasture plants late in summer and in fall will be low, but, if they are properly fertilized, productivity in spring should be fairly high.

Briensburg silt loam.—This imperfectly drained soil has formed from colluvium or local alluvium on gently sloping alluvial fans of small streams emerging onto large flood plains, on gently sloping areas at the base of upland slopes, or along narrow gently sloping drainage-ways. The colluvium has washed from soils of the uplands of loessal origin. Slopes range from 2 to 4 percent. The forest vegetation is deciduous. Most of the acreage is in the loessal plains section, but some is in practically all parts of the county. The soil is in small areas associated with Dulac, Tippah, and Dickson soils of uplands; Paden and Freeland soils of terrace lands; Alva soils of colluvial lands; and Hymon soils of bottom lands.

The soil is strongly to very strongly acid throughout the profile. The content of organic matter is variable from place to place but is generally moderately high; the content of plant nutrients is moderate to low. Surface drainage is moderate and internal drainage slow. The water-holding capacity is apparently high, and the soil is free of stones and gravel but in places includes a small quantity of chert.

Following is a profile description :

0 to 10 inches, grayish-brown mellow silt loam ; 6 to 16 inches thick.

10 to 16 inches, light-brown friable silt loam ; 0 to 6 inches thick.

16 inches +, mottled rust-brown, gray, and light-brown friable silt loam ; 1 to 8 feet thick.

As this young soil has very little, if any, textural profile development, it varies considerably in degree of profile development and drainage. Areas are included that have fairly well-developed textural profiles. Some soil has developed from material washed from Dickson soils and is somewhat better drained than the normal phase. In many places it contains an appreciable quantity of chert fragments. Some poorly drained areas are included ; these are indicated on the map by a wet-spot symbol.

Present use and management.—Most of Briensburg silt loam is cleared and used for crop production. About 40 percent is used for corn, 20 percent for cotton, 10 percent for miscellaneous crops, and 30 percent is in woods or idle open land. The soil is managed like the soils of the adjacent bottom land and in many places is a part of the same field. Crops are not rotated systematically nor is fertilization a common practice except for cotton. Under common management practices corn yields about 25 bushels an acre ; cotton, 240 pounds ; and lespedeza hay, 1.1 tons.

Use and management requirements.—Briensburg silt loam is physically suited to crop production, except as limited by imperfect internal drainage. Compared with the associated upland soils, it is productive of the crops to which adapted. Crop yields, although comparatively high, can easily be increased by an improved management program. Although suited to intensive cropping, it can be maintained more easily in a highly productive state under a short rotation that includes grasses and legumes. Lime, phosphate, and potash are needed for the legume crop, and a complete fertilizer for other crops in the rotation. Applications of potash help to reduce the prevalence of rust on the cotton. The soil is not susceptible to erosion, but diversion ditches at the base of upland slopes improve the drainage and prevent overwash from eroded slopes. Under good management corn yields about 35 bushels an acre ; cotton, 380 pounds ; and lespedeza hay, 1.2 tons.

Bruno loamy fine sand.—An extremely sandy soil in long narrow areas on the natural levees along the Tennessee River. Since mapping, 415 acres of this soil have been covered by the Kentucky Reservoir. The mixed general alluvium from which the soil has formed has washed chiefly from sandy upland soils. Originally the soil supported a deciduous forest vegetation on slopes that do not exceed 3 percent.

The soil is acid, low in organic matter and plant nutrients, and very low in water-holding capacity. It is extremely permeable to air, water, and roots. The surface drainage is moderate and internal drainage very rapid.

This young soil does not have clearly defined surface and subsoil layers. It is associated with Huntington, Lindside, Melvin, Sequatchie, and Wolftever soils.

Following is a profile description :

- 0 to 26 inches, light-brown or yellowish-brown loose loamy fine sand;
20 to 30 inches thick.
- 26 inches +, stratified sandy alluvium; 10 feet thick or more.

Present use and management.—Most of Bruno loamy fine sand is cleared and used for crops—chiefly corn, lespedeza, and peanuts. They are not systematically rotated, however, and fertilizer is not used. About 18 bushels an acre of corn, 500 pounds of peanuts, and 0.4 ton of lespedeza hay can be expected under common management practices.

Use and management requirements.—Bruno loamy fine sand is suited to crop production, but is naturally low in productivity, chiefly because of the low water-holding capacity. A short rotation including a legume to be turned under increases the supply of nitrogen, which is apparently the most needed element in many places. Applications of phosphate and possibly potash are needed for most crops. Moderate applications of fertilizer at frequent intervals are desirable, as the soluble fertilizer elements leach out rapidly.

Cuthbert clay loam, eroded hilly phase.—This is a moderately eroded unproductive soil of the uplands characterized by a tough plastic clay subsoil. It has developed from heavy sandy clay that contains thin platy layers of bluish-gray clay. It was formed on 12- to 25-percent slopes and is widely distributed throughout the sandy Coastal Plain section in small areas associated with Ruston, Safford, and Savannah soils of the uplands. The native forest vegetation was deciduous.

The soil is very strongly acid and low in plant nutrients and water-holding capacity. It is apparently very low in organic matter. External drainage is rapid and internal drainage slow. Some accumulation of sandstone fragments is on the surface and commonly throughout the soil profile.

Following is a profile description :

- 0 to 6 inches, grayish-yellow friable clay loam; 0 to 8 inches thick.
- 6 to 22 inches, strongly plastic reddish-yellow clay mottled with red, yellow, and gray; 10 to 20 inches thick.
- 22 inches +, reddish-yellow sandy clay with thin layers of gray clay.

A variable quantity of the original surface soil has been lost because of erosion. In some small areas all the surface soil is removed and exposures of the subsoil are common and conspicuous. The mixing of the upper part of the subsoil with remnants of the original surface soil has resulted in a heavier textured surface layer on most of the Cuthbert soil.

Present use and management.—All areas of Cuthbert clay loam, eroded hilly phase, have been cleared and used for crop production, but they are now largely abandoned or are in unimproved pasture. A small part is used for crops, but the yields are very low.

Use and management requirements.—Cuthbert clay loam, eroded hilly phase, is very poorly suited to crops or pasture, chiefly because of low fertility, low water-holding capacity, steepness, and poor tilth conditions. It is probably best used for forests, although reforestation is difficult and special measures are required to establish a stand.

Cuthbert clay loam, severely eroded hilly phase.—This severely eroded unproductive soil of the uplands is characterized by a tough plastic clay subsoil. It has formed from sandy clay that contains thin layers of bluish-gray clay. The slopes range from 12 to 25 percent, although a small acreage is included that has 5- to 12-percent slopes. The soil is distributed throughout the sandy Coastal Plain section of the county, associated chiefly with Ruston, Safford, Savannah, Eupora, Hymon, and Beechy soils.

Most of the original surface layer and a part of the subsoil have been lost as a result of accelerated erosion. Shallow gullies are common. The present surface layer is heavy in texture, owing to the mixing of the remnants of the original surface layer and the upper part of the subsoil. External drainage is very rapid, but internal drainage is slow. The soil is very low in organic matter, in plant nutrients, and in water-holding capacity, and is very strongly acid. In some places there has been a considerable accumulation of sandstone fragments on the surface and in the plow layer.

Following is a profile description:

0 to 4 inches, grayish-yellow or reddish-yellow moderately plastic clay loam;
0 to 6 inches thick.

4 to 20 inches, strongly plastic reddish-yellow clay mottled with red, yellow,
and gray; 10 to 20 inches thick.

20 inches +, reddish-yellow sandy clay with thin layers of gray clay.

Present use and management.—Though all of Cuthbert clay loam, severely eroded hilly phase, is cleared, practically all of it is in waste-land except for a small part in unimproved pasture. Crops generally are almost a complete failure, and pasture yields are extremely low.

Use and management requirements.—Cuthbert clay loam, severely eroded hilly phase, is very poorly suited to crops or pasture, chiefly because of low fertility, steepness, poor tilth conditions, and low water-holding capacity. It is best used for forest but is difficult to reforest, and special preparation is probably required.

Cuthbert fine sandy loam, hilly phase.—This shallow soil of the uplands is characterized by a tough plastic subsoil. It has developed on slopes of 12 to 25 percent from heavy sandy clay that has a thin platy layer of bluish-gray clay. The forest vegetation is deciduous. This separation is widely distributed throughout the sandy Coastal Plain section of the county in close association with Ruston, Safford, Savannah, Eupora, Hymon, and Beechy soils.

This soil is strongly to very strongly acid, low in plant nutrients and water-holding capacity, and apparently low in organic matter. External drainage is rapid and internal drainage slow. Some small sandstone fragments are on the surface and throughout the profile, but not enough to interfere materially with cultivation.

Following is a profile description:

0 to 8 inches, gray loose fine sandy loam; 6 to 12 inches thick.

8 to 24 inches, strongly plastic reddish-yellow clay highly mottled with red,
yellow, and gray; 10 to 20 inches thick.

24 inches +, reddish-yellow sandy clay with thin layers of bluish-gray clay.

Present use and management.—Practically all areas of Cuthbert fine sandy loam, hilly phase, are still in forest, chiefly slow-growing black-jack and post oaks. The forests have been cut over and now contain very little marketable timber.

Use and management requirements.—Cuthbert fine sandy loam, hilly phase, is very poorly suited to crops or pasture, chiefly because of steepness of slope, low fertility, and high susceptibility to erosion. It is probably best used for forest. The management is concerned chiefly with increasing the yield and quality of timber.

Cuthbert fine sandy loam, steep phase.—This steep shallow soil of the uplands is characterized by a mottled heavy clay subsoil. The deciduous forest vegetation consists chiefly of blackjack and post oaks. Slopes range from about 25 to as much as 50 percent. Areas are widely distributed throughout the sandy Coastal Plain section of the county in association with the Ruston, Safford, and Savannah soils of the uplands.

The soil is strongly to very strongly acid, low in plant nutrients and water-holding capacity, and apparently low in organic matter. External drainage is very rapid and internal drainage slow. Some small sandstone fragments are on the surface and throughout the profile, but not enough to interfere materially with cultivation.

Following is a profile description:

0 to 8 inches, gray loose fine sandy loam; 6 to 14 inches thick.

8 to 20 inches, strongly plastic reddish-yellow clay highly mottled with red, yellow, and gray; 8 to 20 inches thick.

20 inches +, reddish-yellow sandy clay with thin layers of bluish-gray clay.

Present use and management.—Practically all of Cuthbert fine sandy loam, steep phase, is still in forests, which have been cut over and consequently contain very little marketable timber. Blackjack and post oaks, the dominant trees, are slow-growing and of low quality. The forests are allowed to burn over at frequent intervals, and many areas are grazed.

Use and management requirements.—Cuthbert fine sandy loam, steep phase, is considered unsuitable for either crops or pasture, chiefly because of steepness of slope, low fertility, and extreme susceptibility to erosion. It is probably best used for forest. Management is concerned chiefly with increasing the yield and quality of timber.

Dexter silt loam, eroded undulating phase.—This is well-drained brown soil of undulating terraces on slopes of 2 to 5 percent; it developed from old alluvium washed from upland soils derived from loess or Coastal Plain sand and clay. The soil is associated with other Dexter soils and with Freeland, Hatchie, and Almo soils on the terraces of the major streams in the western part of the county. Most of the soil is on terraces of the Big Sandy River and Rushing Creek. The average size of the individual areas is less than 5 acres.

Most of the original surface soil has been lost through erosion, and the present layer varies considerably in thickness. The subsoil is occasionally mixed with the original surface soil but is exposed in only a few places. Over most areas the plow layer is entirely within the original surface soil.

The soil is relatively high in content of plant nutrients and water-holding capacity. It apparently contains a moderate quantity of organic matter, although the layer of highest organic-matter content has been removed by erosion or lost through cropping. External drainage is moderate to slow and internal drainage moderate. The soil is readily permeable to air, roots, and water.

Following is a profile description:

- 0 to 8 inches, grayish-brown or light-brown mellow silt loam; 0 to 10 inches thick.
- 8 to 40 inches, reddish-brown or brownish-red friable silty clay loam; 20 to 35 inches thick.
- 40 inches +, yellowish-brown to brownish-red friable silty clay loam or clay loam, highly variable in texture and color, and extending to a depth of 5 to 15 feet.

Variations are due chiefly to differences in degree of erosion. Some small areas are uneroded or only slightly eroded, whereas others are severely eroded.

Present use and management.—Practically all of Dexter loam, eroded undulating phase, is cleared and has been used for crops and pasture. About 20 percent is used for corn, 30 percent for cotton, and the rest for miscellaneous crops or pasture; only a very small part is idle. A wide variety of crops are grown, but they are not rotated systematically and not all are commonly fertilized. Cotton generally receives about 200 pounds of 20-percent superphosphate or of a 4-10-4 mixture. In recent years many of the farmers have begun using lime and phosphate on the legume hay crop. Under the average management practices yields of 25 bushels an acre of corn, 320 pounds of cotton, and 1.2 tons of lespedeza hay can be expected.

Use and management requirements.—Dexter silt loam, eroded undulating phase, is an excellent soil for crops or pasture. It has a mild relief, good tilth properties, high water-holding capacity, and relatively high fertility. It is responsive to good management and is suited to a wide variety of crops. A comparatively high state of productivity can be maintained under a short rotation, which should include a legume crop, preferably a deep-rooted one. Applications of phosphate are needed for all crops, and nitrogen is needed for all except the legume crop and the crop immediately following. To establish and maintain the legume crop, lime is needed. A winter cover crop, preferably a legume or a legume and small-grain mixture, should follow all clean-cultivated crops. Special practices, as terracing, are not needed for runoff and erosion control. Under good management practices 40 bushels of corn, 480 pounds of cotton, and 1.8 tons of lespedeza hay an acre are average expected yields.

Dexter silt loam, eroded rolling phase.—This well-drained moderately eroded soil of terrace lands developed from old mixed alluvium washed from upland soils derived from loess or Coastal Plain sand and clay. The native deciduous forest vegetation consisted chiefly of red and white oaks, hickory, beech, elm, and cherry. The slopes range from 5 to 12 percent. The soil occurs along many of the large streams in the western part of the county, the largest acreage along the Big Sandy River and Rushing Creek. The individual areas have an average size of about 5 acres and are closely associated with Free-land, Briensburg, Hymon, and Beechy soils.

Most of the original surface soil has been lost through erosion, but usually enough remains to form the plow layer. The subsoil may be exposed at the surface in a few places. The soil is moderately high in organic-matter and plant-nutrient content, and in water-holding capacity. It is readily permeable to air, roots, and water. Internal and external drainage are moderate. The surface soil is relatively

free of gravel, although the lower layers often contain a considerable quantity.

Following is a profile description :

0 to 6 inches, grayish-brown or light-brown friable silt loam ; 0 to 10 inches thick.

6 to 32 inches, reddish-brown or brownish-red friable silty clay loam ; 20 to 30 inches thick.

32 inches +, brownish-red friable clay loam splotted with yellow and gray and extending to a depth of 5 to 15 feet, usually increasingly sandy with depth.

Variations are chiefly in slope and erosion. Although most of the acreage is within the 5- to 12-percent slope, a few small included areas have a 12- to 25-percent range. Inclusions of uneroded and of severely eroded soil vary in use and management requirements, but are of too small acreage for separation on the soil map.

Present use and management.—All areas of Dexter silt loam, eroded rolling phase, are cleared and used for crops or pasture. About 20 percent is in corn, 30 percent in cotton, 25 percent in hay and pasture crops, and 25 percent in miscellaneous crops, idle land, or forest. A variety of crops are grown but not in any systematic rotation designed to improve the soil.

Cotton is generally fertilized with a 200-pound application per acre of 20-percent superphosphate or a 4-10-4 mixture. Fertilization of the other crops is not commonly practiced. In recent years some farmers have used lime and phosphate on the legume crop, the usual application being about 2 tons of lime and 200 pounds of triple superphosphate. Under common management practices corn yields about 22 bushels; cotton, 280 pounds; and lespedeza hay, 1.0 ton.

Use and management requirements.—Dexter silt loam, eroded rolling phase, is a desirable soil for crops. It is productive, responsive to good management, and well suited to a wide variety of crops. High yields can be maintained under a moderately short rotation that includes a legume. Moderate applications of lime and phosphate are needed for the legume crop. Phosphate increases the yields of most crops, and nitrogen is needed for all except the legume crop and the crop immediately following. Growing winter cover crops as a source of nitrogen, as protection from erosion, and as a green-manure crop is a desirable practice. Special measures, as terracing, may be necessary and desirable for the control of runoff and erosion, but the necessity for such measures depends on other management practices. Under good management corn yields 35 bushels an acre; cotton, 420 pounds; and lespedeza hay, 1.6 tons.

Dickson silt loam, undulating phase.—This moderately well-drained siltpan soil of the uplands is identified by the 2- to 4-foot chert-free layer over very cherty material. The parent material consists chiefly of wind-blown silt but contains a mixture of cherty limestone residuum in most places. This soil is on 2- to 5-percent slopes on the broad ridge crests in the cherty limestone hill section of the county and is closely associated geographically with the Bodine and Mountview soils. The deciduous forest vegetation is chiefly oak.

The surface soil and subsoil are free of chert, but in some places a few chert fragments are in the siltpan, and the material below the siltpan is very cherty. The upper part of the profile is permeable to

air, roots, and water, but the siltpan is very slightly permeable. External drainage is moderate and internal drainage moderately slow. The soil has a low water-holding capacity and is apparently low in organic matter and plant nutrients. It is strongly to very strongly acid.

Following is a profile description:

- 0 to 8 inches, yellowish-gray mellow silt loam; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 24 to 40 inches, siltpan, compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.
- 40 inches +, cherty limestone residuum; 10 feet or more thick.

Present use and management.—Practically all of Dickson silt loam, undulating phase, is in woods, chiefly post, blackjack, red, and white oaks. The timber grows slowly. The selective cutting of the better quality trees has left many unmarketable ones in the stand. The burning and grazing of the woodland also lowers production.

Use and management requirements.—Dickson silt loam, undulating phase, is physically suitable for the production of a wide variety of crops, but owing chiefly to low fertility and low water-holding capacity, it is only moderately productive of most crops. It is suited to a fairly short rotation that does not include a row crop more frequently than 1 in every 4 years. The rotation should include a legume, and the intertilled crop should be followed by a cover crop.

Lime, phosphate, and possibly potash are necessary for the legumes, especially if they are deep-rooted. Nitrogen should be applied to all except the legume crop and the crop immediately following. Complete fertilizer is needed for cotton and for all grain crops. A legume cover crop, as vetch or crimson clover, sown after the intertilled crop will protect against erosion and add nitrogen and organic matter to the soil. Because of the low water-holding capacity, the corn crop is frequently injured by droughts. Small grains give proportionally higher yields than other crops, chiefly because they mature during the season of higher rainfall. Under good management 35 bushels an acre of corn, 440 pounds of cotton, and 1.5 tons of lespedeza hay can be expected.

Dickson silt loam, eroded undulating phase.—This moderately well-drained eroded siltpan soil of the uplands developed from a thin layer of wind-blown silt that is underlain at 2 to 4 feet by very cherty limestone material. The forest growth consisted chiefly of oaks. This soil is on 2- to 5-percent slopes on ridge crests and is widely distributed throughout the cherty limestone hill section. It is associated with Mountview and Bodine soils.

Most of the original surface layer has been lost through erosion. The plow layer still consists of the original surface layer, although there is some mixing with the subsoil. A few small severely eroded spots are conspicuous, owing to the exposure of the subsoil.

The surface and subsoil layers are free of chert, although in some places chert is in the siltpan and the material below the siltpan is very cherty. The upper part of the profile is permeable, but the siltpan is only slightly permeable. External drainage is moderate and in-

ternal drainage moderately slow. The soil is low in water-holding capacity and in organic matter and plant nutrients and is strongly to very strongly acid.

Following is a profile description :

- 0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 22 to 38 inches, siltpan of compact silty clay loam mottled with gray, yellow and brown; 12 to 20 inches thick.
- 38 inches +, cherty limestone residuum; 10 feet or more thick.

Present use and management.—All of Dickson silt loam, eroded undulating phase, is cleared, and a large part is used for crop production. About 30 percent is used for corn, 20 percent for cotton, 20 percent for hay, chiefly lespedeza, 10 percent for miscellaneous crops, and 20 percent is idle. The crops are not grown in systematic rotations, and adequate fertilization is not practiced. With ordinary management 18 bushels of corn, 240 pounds of cotton, and 0.8 ton of lespedeza hay are obtained.

Use and management requirements.—Dickson silt loam, undulating phase, is physically well suited to crop production. The management is concerned chiefly with increasing the fertility and checking the loss of soil material by erosion. A rotation including adequately fertilized grasses and legumes should increase crop yields and aid in checking erosion. An intertilled crop should not be grown more often than 1 in every 4 years.

All crops need phosphate and possibly potash. Cotton and legume crops are especially responsive to potash. Proportionately better yields of small grain than of corn are obtained. Winter legume crops, as vetch and crimson clover, should follow the intertilled crop or be sown with small grain. These crops add some nitrogen and organic matter to the soil, as well as check runoff and erosion. Heavy liming is necessary to establish a deep-rooted legume, and an application of nitrogen is needed for all except the legume crop and the crop immediately following. Under good management 30 bushels an acre of corn, 400 pounds of cotton, and 1.4 tons of lespedeza hay can be expected.

Dickson silt loam, rolling phase.—This is a moderately well-drained siltpan soil of the uplands, developed from a thin layer of loess underlain at 2 to 4 feet by cherty limestone residuum. It differs from the undulating phase chiefly in having a stronger slope (5 to 12 percent). The chert-free layer also averages somewhat thinner. This soil characteristically occupies long narrow areas on ridge crests throughout the cherty limestone hill section. Steep or hilly Bodine or Mountview soils are on the lower ridge slopes in most places.

The surface soil and subsoil are free of chert, but numerous chert fragments are in the siltpan and the material below the siltpan is very cherty. External drainage is moderate and internal drainage moderately slow. The upper part of the profile is permeable to air, roots, and water; the siltpan is only slightly permeable. The soil is low in plant nutrients and organic matter, strongly to very strongly acid, and low in water-holding capacity.

Following is a profile description :

- 0 to 8 inches, yellowish-gray mellow silt loam ; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam ; 12 to 20 inches thick.
- 24 to 38 inches, siltpan, compact silty clay loam mottled with gray, yellow, and brown ; 10 to 16 inches thick.
- 38 inches +, cherty limestone residuum ; 10 feet or more thick.

Present use and management.—Practically all of Dickson silt loam, rolling phase, is in forest, consisting chiefly of post, blackjack, red, and white oaks. Timber growth is slow, and the quality of timber in the present stand is poor. All areas have been cut over one or more times, and most areas have been injured by burning and grazing.

Use and management requirements.—Chiefly because of the steeper slope, the rolling phase of Dickson silt loam is inferior to the undulating phase for crop production. It is susceptible to erosion and naturally low in productivity, although physically well suited to a wide variety of crops. The crop rotation should consist chiefly of close-growing crops, including legumes, with probably an intertilled crop not more often than 1 in every 5 or 6 years.

Lime and phosphate are needed to establish and maintain a legume crop. Phosphate is needed for all crops, nitrogen for all except the legume crop, and potash for all except the corn crop. Special measures for controlling runoff may be desirable. The row crop should always be on the contour, and terraces may be practical on the long smooth slopes. In general, terraces have not proved successful unless other good management practices also were followed. Under good management, yields of 30 bushels of corn an acre, 400 pounds of cotton, and 1.4 tons of lespedeza hay can be expected.

Dickson silt loam, eroded rolling phase.—This moderately well-drained siltpan soil of the uplands has developed on slopes of 5 to 12 percent, chiefly on the ridge crests in the cherty limestone hill section, and is associated with Bodine and Mountview soils. It differs from the rolling phase in being eroded. The parent material consists of a thin layer of loess underlain at 2 to 4 feet by cherty limestone residuum. The native vegetation was deciduous.

The original surface layer has been mostly lost through erosion, and now consists of a mixture of subsoil and the remnants of the original surface soil. The quantity of subsoil material incorporated in the surface layer has not materially affected the texture, but it is heavier in some places. Small conspicuous spots of exposed subsoil are common.

The surface and subsoil layers are free of chert, but numerous chert fragments are in the siltpan and the material below the siltpan is very cherty. The upper part of the profile is permeable, but the siltpan is only slightly so. External drainage is moderate and internal drainage moderately slow. The soil is low in plant nutrients, organic matter, and water-holding capacity and is strongly to very strongly acid.

Following is a profile description :

- 0 to 6 inches, grayish-yellow or brownish-yellow mellow silt loam ; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty loam ; 12 to 20 inches thick.

22 to 36 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 10 to 16 inches thick.

36 inches +, cherty limestone residuum; 10 feet or more thick.

Present use and management.—All of Dickson silt loam, eroded rolling phase, is cleared and used for crops and pasture. About 20 percent is used for corn, 10 percent for cotton, 20 percent for hay, 10 percent for miscellaneous crops, and 40 percent is idle. Crops are not rotated with the aim of soil improvement, nor is fertilizer generally used. Some fertilizer is used on cotton, and in recent years some lime and phosphate have been used on the hay crop. About 16 bushels of corn an acre, 220 pounds of cotton, and 0.7 ton of lespedeza hay are expected under common management practices.

Use and management requirements.—Dickson silt loam, eroded rolling phase, is physically suited to a wide variety of crops but naturally low in productivity, and continuous cropping and erosion have further reduced yields. Management is concerned chiefly with controlling erosion and with increasing fertility. A long rotation consisting mainly of close-growing crops is desirable. The soil could be maintained with a rotation that includes a row crop 1 in every 5 years. It is low in content of lime, phosphate, nitrogen, and potash, and applications of these are needed for most crops. A legume crop in the rotation adds nitrogen and organic matter, and a legume winter cover crop should follow the intertilled crop. The row crops should be on the contour, and terraces, if properly constructed and maintained, aid in controlling erosion. Under good management practices corn yields average about 25 bushels an acre, cotton about 380 pounds, and lespedeza hay about 1.2 tons.

Dickson silty clay loam, severely eroded rolling phase.—This severely eroded siltpan soil is underlain by very cherty material. The parent material consists of a thin layer of wind-blown silt with probably a small mixture of cherty limestone residuum. It is a moderately well-drained soil on slopes of 5 to 12 percent. This soil is in small areas widely distributed throughout the cherty limestone hill section of the county and is associated chiefly with Bodine, Mountview, and other Dickson soils.

Most of the original surface soil has been removed by accelerated erosion, and shallow gullies are common. The plow layer consists largely of the upper part of the subsoil but includes remnants of the original surface layer. The removal of material has been very uneven; all the original surface and part of the subsoil have gone in some places, but in other parts of the same area as much as 6 inches of surface soil remains.

This soil is strongly to very strongly acid. It is very low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are free of chert, but the siltpan layer is cherty in some places and the material below the siltpan is very cherty.

Following is a profile description:

0 to 4 inches, grayish-yellow or brownish-yellow friable silty clay loam;
0 to 6 inches thick.

4 to 20 inches, yellowish-brown to brownish-yellow friable silty clay loam;
12 to 20 inches thick.

20 to 36 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 10 to 16 inches thick.

36 inches +, cherty limestone residuum; 10 feet thick or more.

Present use and management.—All of Dickson silty clay loam, severely eroded rolling phase, was once cleared for crop production but is now largely idle or in wasteland. The yields from crops and pasture are extremely low. Erosion on the abandoned areas is stabilized very slowly under natural conditions.

Use and management requirements.—Dickson silty clay loam, severely eroded rolling phase, is of very low productivity for both crops and pasture in its present condition. Although difficult to establish and maintain, a pasture on this soil is probably its best use. The application of lime, phosphate, and probably potash is necessary, and engineering devices, as terraces, diversion ditches, and check dams in the gullies, will likely be necessary to control runoff until the vegetation is established. Even under the best management, pasture yields will be low during the period of rehabilitation.

If it is necessary to use this soil for crops, the rotation should include chiefly close-growing crops, grasses, and legumes, preferably deep-rooted legumes. Lime and fertilizer are needed for best results. Cultivation should be on the contour, and strip cropping may be desirable on the long slopes. Terraces would probably be needed to aid in control of runoff.

Dulac silt loam, undulating phase.—This moderately well-drained stone-free soil of the uplands has siltpan at a depth of about 2 feet. The parent material consists of a thin layer of loess underlain by slowly permeable Coastal Plain material. The underlying material is predominantly a uniform sandy clay, but in some places it consists of stratified layers of sand and clay, or sand that has a layer of ferruginous sandstone between the silt and sand. The soil has developed on 2- to 5-percent slopes. The native forest vegetation was deciduous.

This phase is on the ridge crests and slopes in the loessal plain section and on the broad ridge crests in the sandy Coastal Plain section of the county. The largest and most extensive areas are in the vicinity of Camden, Big Sandy, and McIlwain. It is in the Dulac-Savannah-Briensburg and Safford-Cuthbert-Ruston soil associations (see pls. 8 and 11). The soil is associated chiefly with Briensburg, Hyman, Beechy, Tippah, Savannah, Cuthbert, and Safford soils.

The soil is low in organic matter, plant nutrients, and water-holding capacity and is strongly to very strongly acid. The surface soil and subsoil are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderate to slow.

Following is a profile description:

- 0 to 8 inches, yellowish-gray mellow silt loam; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 24 to 42 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.
- 42 inches +, slowly permeable sandy clay.

Present use and management.—Practically all of Dulac silt loam, undulating phase, is in forest, chiefly oak. Timber growth is slow and the quality of the present stand is poor. Though some of this soil is on ridge crests isolated by extensive areas of soils very poorly suited to crops, most of it is in small regular-shaped areas associated with

soils that are suited to crops. These areas, however, have not been cleared, chiefly because they have not been needed on the particular farm.

Use and management requirements.—Dulac silt loam, undulating phase, is fairly well suited to the production of most crops commonly grown in the county. It has good tilth, a mild relief, and is free of stones; but, on the other hand, it is apparently low in organic matter, lime, phosphorus, nitrogen, and potash. In addition, it is characterized by an extremely well-developed siltpan that interferes with internal movement of water and restricts root penetration. Chiefly because of low fertility and restricted drainage, the soil is low in natural productivity and somewhat limited in use suitability (pl. 3, A). It responds readily to good management but the response is not lasting. Cultivated areas are susceptible to erosion that results in serious injury in most cases. Consequently, if the soil is cleared, management is concerned chiefly with the addition of needed fertilizer and the control of erosion.

Dulac silt loam, eroded undulating phase.—This is a moderately eroded siltpan soil of the uplands. The parent material consists of a thin layer of loess underlain by slowly permeable Coastal Plain material. It has developed on slopes of 2 to 5 percent and is moderately well drained. The forest vegetation consists of oaks. This phase is widely distributed throughout the loessal plain and sandy Coastal Plain sections, where it is associated chiefly with Briensburg, Hymon, Beechy, Savannah, Cuthbert, and Safford soils.

Most of the surface layer has been lost through erosion. The thickness of the original layer has been materially reduced, and in many places the plow layer includes part of the subsoil. Small severely eroded spots are common and conspicuous because of the exposure of the subsoil. The quantity of subsoil mixed with the plow layer has not significantly changed the texture except over very small areas.

The soil is strongly to very strongly acid and low in plant nutrients, organic matter, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description:

0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.

6 to 22 inches, yellowish-brown or brownish-yellow friable silty clay loam; 12 to 20 inches thick.

22 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.

40 inches +, slowly permeable sandy clay mottled with red, yellow, and gray.

Present use and management.—All of Dulac silt loam, eroded undulating phase, is cleared and most of it is in crops or pasture. About 80 percent is used for corn, 20 percent for cotton, 20 percent for lespedeza hay, 10 percent for miscellaneous crops, and 20 percent is idle or unimproved pasture. Present management practices are not designed to maintain or increase crop yields. Crops are not adequately fertilized nor are they systematically rotated. About 18 bushels of corn an acre, 240 pounds of cotton, and 0.8 ton of lespedeza hay are expected under ordinary management practices.

Use and management requirements.—Dulac silt loam, eroded undulating phase, is well suited physically to the production of most of the crops grown in the county, but the natural productivity is low. Productivity can be increased, however, by an improved management program that requires (1) a rotation of crops, including legumes and grasses, and (2) proper and adequate fertilization. Phosphate, nitrogen, and potash are needed for most crops, and lime for the legume crop. Most of the crops, except possibly corn, give a profitable response to potash, which is especially needed by cotton. Nitrogen should not be needed for the legume or the crop immediately following. A legume winter cover should follow the intertilled crops to protect the soil from erosion and add valuable nitrogen and organic matter. Special measures for erosion control should not be necessary if other good management practices are followed. Under good management about 80 bushels an acre of corn, 400 pounds of cotton, and 1.4 tons of lespedeza hay can be expected.

Dulac silt loam, rolling phase.—This moderately well-drained siltpan soil of the uplands differs from the undulating phase chiefly in having a stronger slope (5 to 12 percent). The parent material consists of a 2-to-4-foot layer of loess underlain by slowly permeable Coastal Plain material. The forest vegetation is chiefly oak. This phase is on narrow rolling ridge crests or ridge slopes throughout the loessal plain and the sandy Coastal Plain sections, where it is associated chiefly with Briensburg, Cuthbert, Safford, and other Dulac soils.

This soil is strongly to very strongly acid and apparently low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description:

- 0 to 8 inches, yellowish-gray mellow silt loam; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown or brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 24 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 10 to 20 inches thick.
- 40 inches +, slowly permeable sandy clay mottled with red, yellow, and gray.

Present use and management.—Practically all of Dulac silt loam, rolling phase, is in forest, chiefly post, blackjack, red, and white oaks. The tree growth is slow and the quality of the present stand is low. Burning over and grazing have also aided in reducing timber yields.

Use and management requirements.—Dulac silt loam, rolling phase, is suitable for most of the common crops of the county, but chiefly because of the stronger slope it is less well suited than the undulating phase. It is highly susceptible to erosion and to injury from erosion when cultivated. Maintenance or increase of productivity and prevention of erosion require: (1) A long rotation, consisting chiefly of close-growing crops, including legumes and grasses; and (2) proper and adequate fertilization. The need for engineering devices, as terraces for water control, depends to a large extent on the intensity of use. Yields of 80 bushels an acre of corn, 400 pounds of cotton, and 1.4 tons of lespedeza hay can be expected under good management.

Dulac silt loam, eroded rolling phase.—This moderately well-drained eroded siltpan soil of the uplands developed on slopes of 5 to 12 percent. It developed from a thin layer of loess underlain by slowly permeable Coastal Plain material. The native forest vegetation was deciduous. The soil is widely distributed throughout the loessal plain and the sandy Coastal Plain sections of the county, and is closely associated with Cuthbert, Safford, Tippah, Briensburg, and other Dulac soils.

Much of the original surface soil has been removed by erosion, the quantity lost varying greatly from place to place within any area. Enough of the original surface soil, however, remains to constitute the plow layer over most of the area. Small severely eroded spots are common and conspicuous, owing to exposure of the subsoil.

This soil is apparently low in organic matter, plant nutrients, and water-holding capacity. It is strongly to very strongly acid. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description:

0 to 6 inches, grayish-yellow to yellowish-gray mellow silt loam; 0 to 8 inches thick.

6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.

22 to 38 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 10 to 20 inches thick.

38 inches +, slowly permeable sandy clay mottled with red, yellow, and gray.

Present use and management.—All of Dulac silt loam, eroded rolling phase, is cleared and used for crop or pasture production. About 25 percent is used for corn, 20 percent for cotton, 20 percent for hay or pasture, 10 percent for miscellaneous crops, and 25 percent is idle or in wasteland. Very little fertilizer is used except on cotton. About 200 pounds of 20-percent superphosphate or a 4-10-4 mixture is generally used, but this is inadequate for good yields. Crops are not commonly rotated for the purpose of maintaining or increasing productivity. About 16 bushels an acre of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay can be expected under ordinary management.

Use and management requirements.—Dulac silt loam, eroded rolling phase, is physically suited to the production of most of the crops common to the area, but yields are naturally low. It is similar to the eroded undulating phase in use and management requirements. It is more susceptible to erosion, and the rotation should probably be longer and include as many close-growing crops as feasible (pl. 3, *B*). Cultivation should be on the contour; and, if the slopes are long, contour strip cropping should be considered. Terraces may help control erosion, but the advisability of using them on soils with a siltpan is questionable. Unless used in connection with other good management practices, terraces appear to be ineffective in controlling erosion. Under good management about 25 bushels an acre of corn, 380 pounds of cotton, and 1.2 tons of lespedeza hay can be expected.

Dulac silty clay loam, severely eroded rolling phase.—This severely eroded moderately well-drained siltpan soil of the uplands developed on 5- to 12-percent slopes from a thin silt mantle underlain by slowly permeable Coastal Plain material. The soil is distributed

throughout the loessal plain and sandy Coastal Plain sections and is closely associated with Cuthbert, Safford, Tippah, Briensburg, Hymon, Beechy, and other Dulac soils.

Most of the original surface layer has been lost, and shallow gullies have penetrated the subsoil in many places. Enough of the subsoil has been incorporated in the present surface layer to give it a heavier texture in most places. Sheet erosion has been less severe than gully-ing. Closely spaced shallow gullies and intervening, or intergully, areas having much of the original surface soil are characteristic.

This soil is apparently very low in organic matter, plant nutrients, and water-holding capacity and is strongly to very strongly acid. The upper part of the profile is permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate to rapid and internal drainage moderately slow.

Following is a profile description:

- 0 to 4 inches, grayish-yellow or brownish-yellow friable silty clay loam; 0 to 6 inches thick.
- 4 to 20 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 20 to 36 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 10 to 20 inches thick.
- 36 inches +, slowly permeable sandy clay mottled with red, yellow, and gray.

Present use and management.—All of Dulac silty clay loam, severely eroded rolling phase, is cleared and has been used for crop production, but most of it is now either idle or is used for unimproved pasture, or, a small part, for crops. Both crops and pasture yields are low.

Use and management requirements.—Dulac silty clay loam, severely eroded rolling phase, has been severely injured by erosion and in its present condition it has low productivity for both crops and pasture. These are difficult to establish and their rate of growth is extremely slow. The soil is best used and managed for pasture. Lime, phosphate, and probably potash are necessary to establish and maintain a fair pasture. With good management this soil should not be expected to produce much pasture except during wet seasons. Terraces or diversion ditches are necessary to aid in controlling runoff until a sod can be established.

If this soil is used for crops the rotation should be long and consist chiefly of close-growing crops. It also should include grasses and legumes, preferably deep-rooted legumes. These crops are difficult to establish, but sericea lespedeza and sweetclover can probably be established with applications of lime and phosphate. After such a crop has been established it should remain as long as economically feasible. Fertilization is essential for all crops. Cultivation should be on the contour, and contour strip cropping should be practiced if slopes are long.

Egam silty clay loam.—This dark-colored moderately well-drained young soil developed on nearly level flood plains. The native deciduous forest vegetation is chiefly oak, hickory, elm, beech, and sycamore. The parent material consists of mixed alluvium that has washed chiefly from soils formed from limestone. This material was deposited mainly on high first bottoms or in slack water on



- A.** Poor corn crop on recently cleared unproductive Dulac soils.
- B.** Close-growing crops on the highly erosive Dulac silt loam, eroded rolling phase; cropped area in center is on Briensburg soils.
- C.** Fertilized and unfertilized plots of crimson clover on Paden soil: The check plot (right) received no fertilizer; that on the left received the equivalent of 200 pounds of superphosphate and 2 tons of lime per acre.



A. One of the many homes in the Bodine-Ennis-Humphreys soil association on Greendale soils, which are well suited to early spring vegetables
B. Farm home in the highly diversified farming area of the Freeland-Briensburg-Hymon soil association.

low first bottoms. Like the Huntington, this soil is on the Tennessee River flood plain, but in most places at some distance from the river. It is darker, heavier in texture, and less productive than the Huntington soils and is closely associated with Huntington, Lindside, Melvin, Bruno, and Wolftever soils. Since mapping, 1,421 acres have been covered by water in the Kentucky Reservoir.

This medium-acid soil apparently contains a moderate quantity of organic matter and is relatively high in plant nutrients and in water-holding capacity, but the quantity of water available for crops is low. External drainage is slow and internal drainage moderately slow.

Following is a profile description:

- 0 to 12 inches, dark grayish-brown or almost black moderately plastic silty clay loam; 8 to 16 inches thick.
- 12 to 26 inches, grayish-brown to yellowish-brown moderately compact silty clay loam; 10 to 20 inches thick.
- 26 inches +, grayish-brown moderately friable silty clay loam splotted with light gray; 10 feet or more thick.

Differences in texture are apparently due chiefly to accidents of deposition.

Present use and management.—Practically all of Egam silty clay loam is cleared and used for crop production. Corn is the most widely grown crop, but the proportion of the soil in corn is not so high as on the Huntington soils. An appreciable acreage is in lespedeza, cowpeas, soybeans, and oats, and possibly 15 or 20 percent is idle. Fertilizer is not used, nor are crops systematically rotated. Crop yields are extremely variable, depending largely on the quantity and distribution of rainfall. About 25 bushels an acre of corn and 1.3 tons of lespedeza hay are average yields under ordinary management.

Use and management requirements.—Egam silty clay loam is suitable for crop production, but because of periodic overflow and extreme droughtiness it is somewhat limited in use suitability. The management program should include selection of drought-resistant crops and improved seedbed preparation and tillage practices. Corn, the most commonly grown crop, is more susceptible to damage from drought than many others less frequently grown. Cane crops, grown for seed or fodder, are much more drought-resistant and have a higher acreage yield of feed. Lespedeza, soybeans, and cowpeas usually make high yields and rarely are complete failures. Small grains or other crops that mature before the dry summer and fall seasons usually make high yields, but the overflow hazard discourages their production. Spring oats, grown for seed or hay on many farms, are rarely lost as a result of flooding.

The seedbed on this soil is often insufficiently prepared, and tillage practices are poorly timed and inadequate. The soil has a tendency to puddle when plowed too wet and becomes hard and cloddy upon subsequent drying. If allowed to become too dry, it breaks up very cloddy. It can be tilled over a very narrow range of moisture conditions. A well-prepared seedbed will promote better germination and better early growth of crops. The use of a rotation in which a legume is included and the plowing under of green-manure crops should improve both tilth and productivity.

Although 60 or 70 bushels an acre of corn are obtained in favorable seasons, the average yield under good management is about 35 bushels.

Under similar management 1.5 tons of lespedeza hay and 2 tons of soybean hay can be expected.

Ennis silt loam.—This well-drained brown soil of first bottoms is similar to the Huntington soils in drainage and many profile characteristics but is formed from a specific type of alluvium. The material has washed almost entirely from soils of the uplands derived from cherty limestone, although some loess is probably included. It has developed on nearly level flood plains on slopes not exceeding 3 percent. It is along the creeks in all parts of the cherty limestone hill section of the county and is closely associated with Humphreys soils of terrace lands, Greendale soils of colluvial lands, and Bodine soils of uplands. Areas occur as long narrow strips and are included in fields with the Greendale and Humphreys soils in most places. The native forest vegetation was deciduous. Since this soil was mapped, 1,060 acres have been covered by the Kentucky Reservoir.

This soil is medium to strongly acid, moderately high in organic matter, plant nutrients, and water-holding capacity, and readily permeable to air, roots, and water. External drainage is slow and internal drainage moderate. Some water-worn chert is usually on the surface and throughout the profile, but not enough to interfere materially with cultivation. The quantity of chert in the lower layers is highly variable; loose beds at shallow depths greatly lower the water-holding capacity.

Following is a profile description:

0 to 12 inches, grayish-brown to light-brown friable silt loam; 6 to 18 inches thick.

12 to 24 inches, light-brown friable silt loam; 8 to 20 inches thick.

24 inches +, light-brown or grayish-brown friable silt loam or cherty silt loam spotted with gray, becoming more cherty with depth; stratified alluvium at 3 to 5 feet.

Present use and management.—Nearly all of Ennis silt loam is cleared and used for crops or pasture. About 60 percent is in corn, about 5 percent in peanuts, and the rest chiefly in hay and forage crops. Fertilizer is not commonly used, and the soil is in row crops almost continuously. Under ordinary management practices about 35 bushels an acre of corn, 800 pounds of peanuts, and 1.4 tons of lespedeza hay are obtained.

Use and management requirements.—Ennis silt loam is susceptible to flooding and therefore somewhat limited in use suitability. It has good tilth properties and can be tilled over a wide range of moisture content. The soil is susceptible to scouring or deposition of sandy or gravelly material by floodwaters. Ordinarily, however, flooding benefits the soil by adding sediments high in plant nutrients. The soil is well suited to peanuts, but the quality and yield are less than on the adjacent Humphreys soil. It is more productive of corn, however, than the Humphreys.

The productivity of this soil can be increased considerably by adequate fertilization, including some liming, and by the use of a suitable rotation. The physical characteristics are favorable to a good response to fertilization. Phosphate and nitrogen are needed, and possibly potash, especially for legumes.

The rotation should include legumes or legume-grass mixtures, to be cut for hay or turned under, and rotated with corn. The risk of

loss from flooding makes it inadvisable to grow winter grains. Good yields of corn can be obtained year after year if liberal applications of fertilizer, especially phosphate and nitrogen, are used. Many farmers consider it a good practice to grow alternate rows of corn and soybeans or soybeans in the row with the corn, especially where the crop is to be hogged off. The yield of corn is decreased, but the total yield of feed is increased. About 50 bushels an acre of corn, 1,000 pounds of peanuts, and 1.6 tons of lespedeza hay are expected under good management.

Ennis cherty silt loam.—This well-drained soil of first bottoms formed from alluvium washed chiefly from upland soils underlain by cherty limestone. It differs from Ennis silt loam in having more chert on the surface and throughout the profile. Water-worn chert fragments are sufficiently numerous to interfere materially with cultivation. The slope is nowhere greater than 3 percent. Areas of this soil are along the streams in all parts of the cherty limestone hill section in close association with Humphreys, Greendale, and Bodine soils.

The soil is medium to strongly acid, medium in content of organic matter and plant nutrients, and generally low in water-holding capacity. It is very permeable to air, roots, and water. External drainage is moderate and internal drainage rapid. Workability is impaired by the numerous chert fragments, which render the soil nearly untillable in some places.

Following is a profile description:

- 0 to 12 inches, grayish-brown or light-brown friable cherty silt loam; 6 to 18 inches thick.
- 12 to 24 inches, light-brown cherty silt loam spotted with gray in the lower part; 8 to 20 inches thick.
- 24 inches +, very cherty alluvium having stratified beds of chert and silt in places; 2 to 10 feet thick.

Present use and management.—The greater part of Ennis cherty silt loam is cleared and used for corn and other crops. A larger part is used for pasture than of Ennis silt loam. Crop yields are much lower than for that soil. Under ordinary management about 18 bushels of corn an acre, 600 pounds of peanuts, and 0.8 ton of lespedeza hay can be expected.

Use and management requirements.—Ennis cherty silt loam is suited to many of the crops common to the area, including corn, peanuts, hay, and most forage crops, but is limited in use suitability because of periodic flooding and is difficult to till because of chertiness. Crop yields are low, chiefly because of the low water-holding capacity. On use and management requirements it is similar to Ennis silt loam, but response to good management is not so great. Under good management practices, about 25 bushels an acre of corn, 700 pounds of peanuts, and 1.4 tons of lespedeza hay can be expected.

Eupora fine sandy loam.—This is an imperfectly drained gently sloping soil on colluvial slopes of 2 to 4 percent. External drainage is moderate and internal drainage slow. In most places imperfect drainage is a result of seepage from the adjacent upland. The colluvium or local alluvium from which the soil has developed has washed from soils of the uplands derived from loess and Coastal Plain material.

The material is highly mixed, but the Coastal Plain sands are predominant. The native forest vegetation was deciduous.

This soil differs from Alva fine sandy loam chiefly in drainage and associated characteristics and from the Briensburg soils in having Coastal Plain material mixed with the loessal material in the colluvium. The soil varies considerably in degree of profile development from place to place, but generally does not have a distinct textural profile. It is widely distributed throughout the sandy Coastal Plain part of the county in small areas, less than 5 acres on the average, associated chiefly with Alva, Hymon, Beechy, Cuthbert, Ruston, Savannah, and Dulac soils.

The soil is strongly to very strongly acid and apparently moderately low in organic matter but higher than the upland soils with which it is associated. The soil has a high water-holding capacity but the fluctuating high water table prevents deep root development, and consequently a crop does not make maximum use of the soil moisture.

Following is a profile description:

0 to 10 inches, grayish-brown loose fine sandy loam; 6 to 12 inches thick.

10 to 16 inches, light-brown friable fine sandy loam; 0 to 10 inches thick.

16 inches +, very friable fine sandy loam mottled with gray, light brown, and rust brown; 1 to 5 feet thick.

Present use and management.—The use and management of Eupora fine sandy loam is similar to that of Alva fine sandy loam, but the yields average less. About 40 percent is used for corn, 10 percent for cotton, 15 percent for hay and pasture, 10 percent for miscellaneous crops, and 25 percent is in idle open land or wooded. It is managed like the Hymon and Beechy soils of the adjacent bottom lands and is usually in the same fields. The crops are not systematically rotated, nor is fertilization a common practice except for cotton. Under ordinary management practices corn yields about 22 bushels an acre, cotton 240 pounds, and lespedeza hay 1 ton.

Use and management requirements.—Eupora fine sandy loam is suited to most of the crops commonly grown. The use suitability is not limited significantly by the imperfect drainage, although average yields are lower than on the well-drained Alva soils. In wet seasons crops are injured by the high water table and yields are less than on the well-drained soils; in dry seasons the yields may be equally as high.

Crop yields can be significantly increased by the use of a short rotation and by proper and adequate fertilization. The rotation can presumably be short but should include a legume crop, preferably one that is to be turned under. Lime and phosphate should be used on the legume crop. Cotton and most other crops need a complete fertilizer containing a fairly high proportion of potash. The potash fertilizer aids in preventing the rust to which cotton is subject on this soil. This soil is not very susceptible to erosion, but a diversion ditch at the foot of the adjacent upland slope improves drainage in many places. Under good management 30 bushels an acre of corn, 380 pounds of cotton, and 1.1 tons of lespedeza hay can be expected.

Freeland silt loam, undulating phase.—This moderately well-drained siltpan soil of the terraces occurs on slopes of 2 to 5 percent along most of the larger streams that drain the loessal plain and

sandy Coastal Plain parts of the county. The deciduous forest vegetation consisted chiefly of oaks. The old mixed alluvium from which the soil is formed has washed from soils of the uplands that are derived from loess or Coastal Plain material. This phase is similar to the Paden soils in drainage and many profile characteristics but differs in having formed from alluvium. It is associated chiefly with Dexter, Hatchie, Almo, Hymon, and Beechy soils. The greater part of this phase is along Rushing Creek in the Freeland-Briensburg-Hymon soil association; important areas are also along the Big Sandy River and Birdsong and Cypress Creeks.

This soil is free of gravel in the surface and subsoil layers, but layers below the siltpan may contain some gravel. It is strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable.

Following is a profile description:

- 0 to 8 inches, yellowish-gray mellow silt loam; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 24 to 42 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 14 to 20 inches thick.
- 42 inches +, yellowish-brown to reddish-brown firm clay loam or fine sandy clay loam splotted with yellow and gray; 2 to 15 feet thick.

Mapped with this soil are small areas having a loam and fine sandy loam surface soil and some areas that are slightly eroded. These variations do not differ significantly in use and management requirements nor in productivity.

Present use and management.—Practically all of Freeland silt loam, undulating phase, is in oak forest. Most areas have been cut over one or more times; consequently the present stand is small and includes many cull trees of moderately slow growth.

Use and management requirements.—Freeland silt loam, undulating phase, is physically well suited to crop or pasture production. It has a mild relief, good tilth properties, and a favorable response to good management, but it is low in organic-matter content, plant nutrients, and water-holding capacity and strongly to very strongly acid. Chiefly because of low fertility and the siltpan development, the soil is relatively low in natural productivity and somewhat limited in use suitability. As most of the cultivated part has been eroded, the use and management requirements are discussed in detail under Freeland silt loam, eroded undulating phase. About 35 bushels of corn, 440 pounds of cotton, and 1.5 tons of lespedeza hay are average acre yields under good management.

Freeland silt loam, eroded undulating phase.—This is an eroded moderately well-drained siltpan soil of terrace lands, differing from the undulating phase chiefly in having lost part of the surface soil through erosion. The parent material consists of old mixed alluvium washed from upland soils derived from loess and Coastal Plain materials. The soil has developed on 2- to 5-percent slopes on high terraces along most of the major streams flowing from the loessal plain and sandy Coastal Plain parts of the county. It is associated chiefly with Dexter, Hatchie, Almo, and other Freeland soils. The forest vegetation is deciduous.

Most of the original surface soil, including the thin layer of higher organic-matter content, has been lost by erosion. In a few places the original surface soil still constitutes the plow layer, but all of it may be gone in some places. The soil is strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description :

- 0 to 6 inches, grayish-yellow to yellowish-gray mellow silt loam; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 22 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 14 to 20 inches thick.
- 40 inches +, yellowish-brown to reddish-brown firm clay loam or fine sandy clay loam spotted with yellow and gray; 2 to 15 feet thick.

This separation includes a small acreage that has a loam or fine sandy loam surface layer and somewhat sandier subsoil layers. The acreage of this variation is so small, however, that it is relatively insignificant.

Present use and management.—All of Freeland silt loam, eroded undulating phase, is cleared and most of it is now used for crops. About 25 percent is used for cotton, 35 percent for corn, 20 percent for hay and pasture, 10 percent for miscellaneous crops, and about 10 percent is idle. The crops are not rotated with regard to maintenance or improvement of productivity. Cotton is generally fertilized with about 200 pounds an acre of a 4-10-4 fertilizer, but other crops are not commonly fertilized. About 18 bushels of corn, 240 pounds of cotton, and 0.8 ton of lespedeza hay are average acre yields under ordinary management practices.

Use and management requirements.—Freeland silt loam, eroded undulating phase, is physically well suited to crop production but naturally low in productivity. It is responsive to good management, however, and the yields can be greatly increased by a rotation including legumes and grasses and by adequate fertilization, which all the crops need. Both lime and phosphate and possibly potash are needed for the legume crop, especially if it is deep-rooted. Phosphate is needed by all crops. Potash and nitrogen should be applied according to current needs, but the quantity required is greatly influenced by the kinds of crops previously grown and the treatment they received. Potash is particularly needed by cotton and by deep-rooted legumes. Nitrogen can probably be more economically supplied by including a legume crop in the rotation at frequent intervals.

The supply of organic matter in the soil is low and probably should be increased and maintained at a higher level. Growing grasses, green manuring, and the application of barnyard manure aid in increasing the organic-matter content. Winter cover crops, preferably legumes, should follow the intertilled crop. They not only aid in erosion control but also add valuable nitrogen and organic matter to the soil. Average acre yields of about 30 bushels of corn, 400 pounds of cotton, and 1.4 tons of lespedeza hay are expected under good management.

Freeland silt loam, rolling phase.—This moderately well-drained siltpan soil of terraces formed from old mixed alluvium washed

from upland soils. The soil has developed on terraces along most of the streams that drain the loessal plain and sandy Coastal Plain parts of the county. It differs from the undulating phase chiefly in having a steeper slope, usually 5 to 12 percent. It is in very small areas associated with Dexter, Hatchie, Almo, Hymon, and Beechy soils. The forest vegetation is chiefly oak.

This soil is free of gravel in the surface and subsoil layers, but there is some below the siltpan. The soil is strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water; the siltpan is only slightly permeable.

Following is a profile description :

- 0 to 8 inches, yellowish-gray mellow silt loam ; 6 to 8 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty loam ; 12 to 20 inches thick.
- 24 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown ; 14 to 20 inches thick.
- 40 inches +, yellowish-brown to reddish-brown clay loam spotted with yellow and gray ; 2 to 15 feet thick.

Present use and management.—Practically all of Freeland silt loam, rolling phase, is in forest, chiefly red, white, post, and blackjack oaks, hickory, elm, and dogwood. All areas have been cut over ; the present stand is of small trees of slow growth.

Use and management requirements.—Freeland silt loam, rolling phase, is physically well suited to most of the common crops, but owing chiefly to the stronger slopes it is more poorly suited than the undulating phase. It is highly susceptible to erosion and to injury from erosion when cleared and cultivated. To maintain or increase the natural productivity and to prevent erosion the following management practices are required : A long rotation of close-growing crops, including legumes and grasses, and adequate fertilization. The need for terraces or other engineering devices for water control depends on other management practices. If cleared, this soil would be used and managed like Freeland silt loam, eroded rolling phase.

Freeland silt loam, eroded rolling phase.—This moderately well-drained siltpan soil of the terraces developed from old alluvium consisting of loess and Coastal Plain sand and clay. It is on high terraces along the major streams on 5- to 12-percent slopes and is moderately eroded.

Much of the original surface soil, including the thin layer of higher organic-matter content, has been lost by erosion. There has been some mixing of the subsoil with the surface soil in the plow layer, but over much of the area the original surface layer constitutes the plow layer. In some small areas, however, this layer is missing and the subsoil is exposed.

This soil is strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable ; the siltpan, only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description :

- 0 to 6 inches, grayish-yellow to yellowish-gray mellow silt loam ; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam ; 12 to 20 inches thick.

22 to 38 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 14 to 20 inches thick.

38 inches +, yellowish-brown or reddish-brown clay loam or fine sandy clay loam splotched with yellow and gray; 2 to 15 feet thick.

A small acreage of this separation has a loam or fine sandy loam surface soil; it is used and managed similarly to the rolling phase.

Present use and management.—All of Freeland silt loam, eroded rolling phase, is cleared and used for crops or pasture. About 25 percent is used for corn, 15 percent for cotton, 25 percent for hay and pasture, 10 percent for miscellaneous crops, and about 25 percent is idle. Crops are not systematically rotated except on a few farms. Cotton is the only crop regularly fertilized; in most cases about 200 pounds an acre of a low-analysis complete fertilizer is used. Some lime and phosphate have been used on the hay crop in recent years, but other crops are not commonly fertilized. Under ordinary management practices about 16 bushels of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay are average acre yields.

Use and management requirements.—Chiefly because of the stronger slope, Freeland silt loam, eroded rolling phase, is less desirable for crop production than the eroded undulating phase, although it is suitable for the production of nearly all crops commonly grown. It is highly susceptible to injury from erosion. Crop rotations should be long ones that include close-growing crops much of the time. Cultivation should be on the contour; on long slopes contour strip cropping should be considered. Terraces may be necessary, but their need will depend largely on other management practices. Fertilizer requirements are similar to those on the eroded undulating phase. About 25 bushels of corn, 380 pounds of cotton, and 1.2 tons of lespedeza hay are average acre yields under good management.

Freeland clay loam, severely eroded rolling phase.—This siltpan soil formed on slopes of 5 to 12 percent from old mixed alluvium on stream terraces. It is moderately well drained and is closely associated with the Dexter, Hatchie, Almo, Hymon, and Beechy soils.

In most places nearly all the original surface soil has been lost, except for small spots on intergully areas, and the plow layer now consists almost entirely of the topmost part of the subsoil. Small shallow gullies are common, and a few are not crossable with heavy machinery.

This soil is very strongly acid, low in organic matter and plant nutrients, and very low in water-holding capacity. The subsoil is permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate to rapid and internal drainage moderately slow.

Following is a profile description:

0 to 4 inches, grayish-yellow to brownish-yellow friable clay loam; 0 to 6 inches thick.

4 to 20 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.

20 to 36 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 14 to 20 inches thick.

36 inches +, yellowish-brown or reddish-brown clay loam or fine sandy clay loam splotched with yellow and gray; 2 to 15 feet thick.

Included is a small acreage that has a clay loam or fine sandy clay loam surface soil. It is similar to the characteristic profile in most respects and does not differ significantly in use and management requirements.

Present use and management.—All of Freeland clay loam, severely eroded rolling phase, though largely abandoned, is cleared and has been used for crops and pasture. Usually the soil was in row crops almost continuously until the yields became extremely low. Most of the erosion probably occurred after yields became unprofitable and the soil was abandoned.

Use and management requirements.—Freeland clay loam, severely eroded rolling phase, has been injured by erosion and in its present condition is of low productivity for both crops and pasture. It can probably be best used and managed for pasture, but for this purpose the application of lime and phosphate and possibly potash is necessary. Even under good management this soil does not produce much pasture except during wet seasons.

If use for crop production is necessary, the rotation should be long and should include chiefly close-growing crops, especially legumes and grasses. Deep-rooted legumes are difficult to establish, but sericea lespedeza and sweetclover can probably be established and maintained if lime and phosphate are applied. Fertilizer is essential for all crops. Cultivation should be on the contour, and on long slopes strip cropping may be advisable. Terraces probably are necessary to aid in controlling runoff and erosion until vegetation is well established. Crop yields are expected to be low even under good management.

Greendale cherty silt loam, undulating phase.—This well-drained soil of the colluvial lands formed from local alluvium or colluvium at the foot of slopes. It is a young soil on 2- to 5-percent slopes and does not have a well-developed textural profile. The parent material is from upland soils derived from cherty limestone. The soil is on gently sloping fans formed by small streams emerging onto the flood plains of larger streams, on narrow bottoms along deeply entrenched stream beds, or on narrow sloping areas at the foot of steep slopes. It is widely distributed in small areas throughout the cherty limestone hill section in close association with Bodine, Humphreys, Ennis, and Dickson soils. The deciduous forest vegetation consists of white and red oaks and hickory. A total of 393 acres of this phase has been inundated by the Kentucky Reservoir.

All parts of the profile contain numerous chert fragments varying from $\frac{1}{2}$ to 4 inches in diameter. The chert in the surface layer interferes materially with cultivation. The soil is medium to strongly acid throughout and moderately low in organic matter, although higher than the adjacent upland soils. It is very porous, extremely permeable to air, roots, and water, and low in water-holding capacity. External drainage is moderate and internal drainage rapid to very rapid.

Following is a profile description:

0 to 10 inches, grayish-brown or brownish-gray friable cherty silt loam; 6 to 14 inches thick.

10 to 20 inches, light-brown or yellowish-brown friable cherty silt loam to light cherty silty clay loam; 8 to 16 inches thick.
20 inches +, brownish-yellow very cherty silt loam splotted with gray; 0 to 10 feet thick.

Present use and management.—About 25 percent of Greendale cherty silt loam, undulating phase, is in forest; 40 percent in corn, 5 percent in peanuts, 5 percent in cotton, 10 percent in miscellaneous crops, and 15 percent in gardens, farmsteads, or idle land. Most of the houses and practically all the gardens in the cherty limestone hill section are on this soil (pl. 4, A). Fertilizer is seldom used except on farm gardens, and the many crops grown are not systematically rotated. Under ordinary management about 25 bushels of corn, 700 pounds of peanuts, and 1.1 tons of lespedeza hay are average acre yields.

Use and management requirements.—Greendale cherty silt loam, undulating phase, is well suited to intensive crop production, but chert interferes with tillage. Because of extremely good drainage and aeration it is well suited to early vegetable crops. As field crops, especially corn, are highly susceptible to injury from drought, the soil is better suited to drought-resistant or early maturing crops.

The productivity of the soil undoubtedly can be increased by improved management practices. Although it produces fairly well without fertilization, it responds very well to fertilization, including liming. All crops need applications of phosphate, and possibly potash. The legume crop needs liming, and all except the legume crop and the crop immediately following need nitrogen. A rotation, which could presumably be short but should include a legume, would increase crop yields. The application of barnyard manure or the turning under of green manure should be highly beneficial. The soil is similar to Humphreys cherty silt loam in use and management requirements. Under good management about 35 bushels an acre of corn, 800 pounds of peanuts, and 1.3 tons of lespedeza hay can be expected.

Greendale cherty silt loam, rolling phase.—This well-drained cherty soil of the colluvial lands differs from the undulating phase chiefly in having a stronger slope (5 to 12 percent). The thickness of the colluvial deposit is also less than that of the undulating phase. The parent material has washed from soils of the adjacent upland slopes underlain by cherty limestone. The soil is widely distributed throughout the cherty limestone hills in association with the Bodine, Dickson, Humphreys, and Ennis soils. The average size of the individual areas is about 4 acres. Since mapping, 120 acres of this phase has been inundated by the Kentucky Reservoir.

The soil is medium to strongly acid and moderate to low in organic-matter content, plant nutrients, and water-holding capacity. It is extremely permeable to air, plants, and water. External drainage is moderate and internal drainage rapid to very rapid. All the layers are cherty, and the plow layer contains sufficient chert to interfere materially with cultivation.

Following is a profile description:

- 0 to 10 inches, grayish-brown to brownish-gray friable cherty silt loam; 8 to 14 inches thick.
- 10 to 20 inches, light-brown or yellowish-brown friable cherty silt loam or light cherty silty clay loam; 8 to 16 inches thick.
- 20 inches +, brownish-yellow very cherty silt loam splotted with gray; 0 to 10 feet thick.

Some cherty colluvial areas are included that have a moderately well-developed textural profile. These areas are less productive and more highly susceptible to erosion, though they generally occur in a complex association with the rolling phase and are used and managed similarly.

Present use and management.—Though used and managed like the undulating phase, a larger part of Greendale cherty silt loam, rolling phase, is in forest. The areas are not cleared in many places unless they are part of a larger field of crop-adapted soils. Crop yields are somewhat lower and more variable than on the undulating phase.

Use and management requirements.—Because of the stronger slopes and the smaller individual areas, Greendale cherty silt loam, rolling phase, is inferior to the undulating phase for crop production. The cleared areas are moderately susceptible to erosion, which removes the finer particles and in many places results in an accumulation of chert fragments on the surface. The use and management requirements are similar to those of the undulating phase.

Guin gravelly loam, hilly phase.—This excessively drained soil of the uplands, which has formed from loose beds of gravel and sand, is characterized by a high content of gravel throughout the profile. The soil is on high ridge slopes of 12 to 25 percent in the northern part of the county in the Lax-Guin-Cuthbert soil association. It is associated chiefly with Lax soils on the ridge crests and Cuthbert or Bodine soils on the lower ridge slopes. The native vegetation was an oak-hickory forest.

The soil is strongly to very strongly acid throughout and is low in organic matter and plant nutrients. All layers are extremely permeable to air, roots, and water. Both internal and external drainage are rapid to very rapid, and the water-holding capacity is very low. In many places large gravelly conglomerates are on the surface and throughout the profile.

This soil does not have a well-developed textural profile, but the one following is representative:

- 0 to 10 inches, gray to yellowish-gray loose gravelly loam; 6 to 14 inches thick.
- 10 to 30 inches, gray to grayish-yellow very gravelly loam; 15 to 30 inches thick.
- 30 inches +, loose gravel mixed with brownish-red sandy loam; 2 to 20 feet thick.

Included with this separation is a small acreage that has a relatively gravel-free brown surface layer, and small areas are included that differ from the hilly phase chiefly in being moderately or severely eroded. These inclusions do not differ significantly from the hilly phase in use and management requirements.

Present use and management.—Most of Guin gravelly loam, hilly phase, is in forest of chestnut, post, blackjack, white, and red oaks and pignut hickory. Since the woods are cut over frequently, the present stand is small and includes many cull trees. Timber growth is very slow, and the stands are injured by fires at frequent intervals. The eroded areas included are largely lying idle or are in unimproved pasture. A negligible acreage is used for crops.

Use and management requirements.—Because of steepness, low fertility, low water-holding capacity, and high content of gravel, Guin gravelly loam, hilly phase, is not considered suitable for crop or pasture production. It is apparently best suited to forestry.

Guin gravelly loam, steep phase.—This excessively drained soil developed on steep upland slopes of 25 to 50 percent. Areas occur in the northern part of the county in the Lax-Guin-Cuthbert soil association. The soil is characterized by a high content of gravel, since the parent material consists of a loose mixture of gravel and sand.

The soil is strongly to very strongly acid, low in organic matter and plant nutrients, and very low in water-holding capacity. All layers are extremely permeable to air, roots, and water; internal and external drainage are rapid. The soil is gravelly throughout, and in many places large conglomerates are on the surface and throughout the profile.

Following is a profile description.

0 to 10 inches, gray to yellowish-gray loose gravelly loam; 6 to 14 inches thick.
10 to 25 inches, gray to grayish-yellow very gravelly loam; 10 to 20 inches thick.

25 inches +, loose gravel mixed with brownish-red sandy loam; 2 to 20 feet thick.

Present use and management.—Practically all of Guin gravelly loam, steep phase, is in oak and hickory forest. Chestnut oak and pignut hickory are the dominant trees. Frequent fires and selective cutting have lowered the quality of the forest, and consequently the present stand is small and includes many cull trees. Timber growth is very slow.

Use and management requirements.—Guin gravelly loam, steep phase, is unsuitable for crops or pasture because of steepness, low fertility, very low water-holding capacity, and high gravel content. It is apparently best suited to forestry.

Guin gravelly loam, rolling phase.—This is an excessively drained gravelly soil of the uplands developed on 5- to 12-percent slopes. The parent material is a mixture of gravel and sand and in some places includes a small quantity of loess. The soil is on narrow winding ridge crests in the highly dissected parts of the Lax-Guin-Cuthbert soil association.

This phase is strongly to very strongly acid and is low in organic matter and plant nutrients. It is extremely permeable to air, roots, and water, but very low in water-holding capacity. External drainage is moderate and internal drainage rapid to very rapid. All the soil layers are gravelly, and in many places large conglomerates are on the surface.

Following is a profile description:

0 to 10 inches, gray to yellowish-gray loose gravelly loam; 8 to 12 inches thick.

10 to 35 inches, grayish-yellow loose gravelly loam; 20 to 30 inches thick.

35 inches +, loose gravel mixed with brownish-red sandy loam; 2 to 20 feet thick.

Present use and management.—Practically all of Guin gravelly loam, rolling phase, is in forest, chiefly oak and hickory and predominantly chestnut oak and pignut hickory. The stand of timber is very poor in most places, and timber growth is apparently slower than on the hilly phase.

Use and management requirements.—Like the hilly phase, Guin gravelly loam, rolling phase, is low in fertility, very low in water-

holding capacity, and high in gravel content. Unlike that soil, it is on relatively mild slopes. Owing to the extreme development of its unfavorable characteristics, the best use is apparently forestry. Even if the soil were suited for crop or pasture production, its occurrence on narrow ridge crests in association with steep Guin soils would make cultivation economically unfeasible.

Hatchie silt loam.—This imperfectly drained siltpan soil of the terraces developed on nearly level areas having 1- to 3-percent slopes. The parent material is old mixed alluvium washed from upland soils derived from loess or Coastal Plain sand and clay. Areas are chiefly on the broader terraces of the major streams that drain the loessal plain and sandy Coastal Plain sections. Most of the total acreage is on the terraces of Rushing, Birdsong, and Cypress Creeks. The deciduous forest vegetation includes many water-tolerant trees.

In places, the soil is between the poorly drained level or slightly depressional Almo soils and the moderately well-drained gently sloping to sloping Freeland soils. It is intermediate between the Freeland and the Almo in drainage, general crop adaptation, and productivity. It resembles the Taft soils of the high Tennessee River terraces in drainage and associated profile characteristics.

This soil is very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are permeable to roots and water, but the siltpan is only very slightly permeable. Drainage, both internal and external, is very slow.

Following is a profile description:

- 0 to 10 inches, gray or yellowish-gray mellow silt loam; 8 to 12 inches thick.
- 10 to 22 inches, pale-yellow friable silty clay loam spotted with gray in the lower part; 8 to 14 inches thick.
- 22 to 44 inches, siltpan of very compact silty clay loam, predominantly gray, but spotted with yellow; 18 to 24 inches thick.
- 44 inches +, gray to mottled gray and yellow moderately friable clay loam or silty clay loam; 2 to 15 feet thick.

A small acreage of Hatchie fine sandy loam is included.

Present use and management.—Most of Hatchie silt loam is cleared and used for crops and pasture. It is generally in small areas associated with Freeland silt loam, undulating phase, and consequently is used and managed like that soil. The requirements of the two soils, however, differ considerably. The average crop yields on the Hatchie soil are very low, and complete crop failures are common.

Use and management requirements.—Under present drainage conditions the use suitability of Hatchie silt loam is somewhat limited. This would be broadened by artificial drainage, but the slowly permeable siltpan and its occurrence in the center of broad level terraces would make drainage difficult. The water table is near the surface during the rainy seasons and prevents deep root penetration. The soil has a low water-holding capacity, which, together with the restricted root system, causes crops to suffer severely from extended droughts. During extended dry periods crops suffer more from lack of water than on the better drained Freeland and Dexter soils.

Lespedeza, redtop, soybeans, and sorghum are fairly well suited to this soil. Fertilization requirements are similar to those for Freeland silt loam, eroded undulating phase, but the crop response may

not be so great. Under good management 20 bushels an acre of corn, 1.2 tons of lespedeza hay, and 1.5 tons of soybean hay can be expected.

Hilly stony land (Talbot and Colbert soil materials).—This separation is in the vicinity of Birdsong Creek in the Bodine-Ennis-Humphreys soil association and occurs on the lower ridge slopes, associated chiefly with Bodine soils. Slopes range from 15 to 30 percent. The soil is underlain by massive limestone and has numerous limestone outcrops that prevent its use for cropland. Less than half the surface consists of limestone outcrops, the spaces between which are filled with heavy soil material ranging from a few inches to 2 or 3 feet thick. This material has properties similar to those of the Talbot or Colbert soils. It is yellowish or reddish and ranges from silty clay loam to silty clay. In addition to bedrock outcrops, loose chert and limestone fragments are over the surface and in the soil in many places.

Present use and management.—Practically all of Hilly stony land (Talbot and Colbert soil materials) is in forest, chiefly cedar but in some places predominantly deciduous. The forests have been cut-over a number of times, and the present stand is sparse and small.

Use and management requirements.—Hilly stony land (Talbot and Colbert soil materials) is unsuited to crops and very poor for pasture. It is physically best suited to forestry, but a few of the less stony areas may be used for pasture under optimum conditions.

Humphreys silt loam.—This well-drained soil of low terraces occurs in moderate-sized areas along the major creeks in the cherty limestone hill section. It has developed from alluvium washed from upland soils that are derived from cherty limestone, although it may contain a small mixture of loess. The slopes are nearly level to gently sloping (1 to 5 percent). The soil is closely associated with Ennis, Greendale, Bodine, and Dickson soils. The native forest was chiefly red and white oaks and hickory. Since mapping, 514 acres have been inundated by the Kentucky Reservoir.

The soil is strongly acid, medium in content of organic matter and plant nutrients, and high in water-holding capacity. It is very permeable to air, roots, and water. External drainage is moderately slow and internal drainage moderate. Some small water-worn chert fragments are in the surface layer in most places, but they do not interfere with tillage. The lower layers vary considerably in content of chert; in many places they are extremely cherty.

Following is a profile description:

- 0 to 10 inches, grayish-brown, light-brown, or brown mellow silt loam; 8 to 12 inches thick.
- 10 to 30 inches, light-brown or yellowish-brown to brownish-yellow friable light silty clay loam; 18 to 24 inches thick.
- 30 inches +, brownish-yellow heavy silt loam or cherty silt loam spotted with gray; 2 to 10 feet thick.

Present use and management.—Nearly all of Humphreys silt loam is cleared and used intensively for crop production. Corn, peanuts, and lespedeza are the major crops. About 15 percent is in peanuts, 10 percent in cotton, 40 percent in corn, 15 percent in miscellaneous crops, and 20 percent in woods or lying idle. Fertilizer is seldom used on this soil, and the crops are not rotated systematically. Under

ordinary management practices average acre yields of about 30 bushels of corn, 900 pounds of peanuts, and 1.2 tons of lespedeza hay are obtained.

Use and management requirements.—Humphreys silt loam is moderately fertile and is productive of most of the common crops. It occurs in an area having a small percentage of cropland, so that on most farms it must be used almost continuously for crops. It has good tilth properties, a high water-holding capacity, and is not very susceptible to erosion; consequently, it should be well suited to intensive use.

Crop yields can be maintained or increased by adequate fertilization. Although the soil produces well without fertilizer, it responds well to fertilizer and lime. A systematic rotation should be followed; presumably it can be short, but it should be one that includes a legume. Following the intertilled crop, a legume cover crop should be planted and turned under as green manure. Lime and phosphate are needed for the legume crop, and phosphate is required for maximum yields of all crops. If legumes are not included in the rotation, nitrogen will be needed for all crops. Under good management 45 bushels of corn, 1,200 pounds of peanuts, and 1.6 tons of lespedeza hay are average acre yields.

Humphreys cherty silt loam.—This well-drained cherty soil of low terraces along small streams has developed on 1- to 5-percent slopes from alluvium washed from upland soils. The soil is widely distributed throughout the cherty limestone hill section in association with Ennis, Greendale, Bodine, and Dickson soils. The forest vegetation is deciduous.

The soil is strongly to very strongly acid, medium in content of organic matter and plant nutrients, and moderately low in water-holding capacity. It is extremely permeable to air, roots, and water. External drainage is moderate and internal drainage rapid. In the plow layer cherty material constitutes 25 to 50 percent of the soil mass. The chert fragments are $\frac{1}{2}$ to 6 inches in diameter and in sufficient quantity to interfere materially with cultivation.

Following is a profile description:

- 0 to 10 inches, grayish-brown or light-brown friable cherty silt loam; 8 to 12 inches thick.
- 8 to 30 inches, light-brown or yellowish-brown to brownish-yellow friable cherty silty clay loam; 16 to 24 inches thick.
- 30 inches +, brownish-yellow very cherty silt loam spotted with gray; 2 to 10 feet thick.

Present use and management.—Most of Humphreys cherty silt loam is cleared and used for crops or pasture. All the common crops, but chiefly corn, peanuts, and lespedeza, are grown to some extent. The soil is in row crops almost continuously, with an occasional crop of lespedeza hay. Some lime and phosphate have been used in recent years, but adequate fertilization is not a common practice. The crop yields are considerably lower than on Humphreys silt loam. Average acre yields under ordinary management are about 18 bushels of corn, 700 pounds of peanuts, and 0.7 ton of lespedeza hay.

Use and management requirements.—Humphreys cherty silt loam is suited to crop production, but the chert fragments in the plow layer materially interfere with cultivation. Moderate fertility and low

water-holding capacity limit the crop yields. The use and management requirements are similar to those for Humphreys silt loam, but the response to improved management is usually not so good. Acre yields of about 25 bushels of corn, 900 pounds of peanuts, and 1 ton of lespedeza hay can be expected under good management.

Huntington silt loam.—This is a well-drained highly productive soil on well-drained parts of first bottoms along the Tennessee River. The recent alluvium from which the soil has formed is highly mixed; some has washed from the soils that were derived from limestone. The soil is on nearly level flood plains in long narrow strips closely associated with Egam, Bruno, Lindside, Melvin, Wolftever, and Sequatchie soils. It is a young soil, and there is very little horizon differentiation. Slopes do not exceed 3 percent. The deciduous forest vegetation consists of red and white oaks, hickory, elm, beech, maple, ash, and sycamore. Since mapping, 890 acres of this soil have been inundated by the Kentucky Reservoir.

The soil is slightly acid to neutral throughout the profile and is high in organic matter, plant nutrients, and water-holding capacity. It is moderately permeable to air, roots, and water. External drainage is moderately slow and internal drainage moderate.

Following is a profile description:

- 0 to 12 inches, brown or light-brown friable silt loam or heavy silt loam; 6 to 18 inches thick.
- 12 to 30 inches, light-brown friable heavy silt loam or silty clay loam; 10 to 30 inches thick.
- 30 inches +, light-brown friable silt loam splotted with gray and containing an appreciable quantity of sand in many places; 2 to 20 feet thick.

Present use and management.—Practically all of Huntington silt loam is cleared and used for crop production. About 80 to 90 percent of the cleared land is in corn and most of the rest in lespedeza. Little of the soil is ever idle; on most areas corn is grown year after year without crop rotation, and fertilizer is rarely, if ever, used. About 45 bushels of corn and 1.8 tons of lespedeza hay are average acre yields under ordinary management.

Use and management requirements.—Huntington silt loam is the most fertile and probably the most productive soil in the county for the crops to which it is suited. The durability of the soil and its high natural fertility, augmented almost yearly by the deposition of sediment by floodwaters, have made it possible to produce large crop yields year after year. The susceptibility to flooding, however, limits the variety of crops that can be grown.

Many hay and forage crops are suited and are grown in rotation with the corn on the less productive areas. Since the soil is suited to almost continuous corn production without fertilization, improved management practices will be concerned chiefly with improved seed-bed preparation, tillage practices, and the selection of higher yielding seed varieties or hybrids. About 55 bushels of corn, 1.9 tons of lespedeza hay, and 2.2 tons of soybean hay are average acre yields under good management. Although good yields can be had without fertilization, this soil would respond well to such judicious fertilization as heavy nitrogen applications to corn.

Hymon silt loam.—This is an imperfectly drained soil on low first bottoms of most streams in the loessal plain and sandy Coastal Plain

sections. Slopes are not greater than 3 percent. The soil is formed from mixed alluvium washed from upland soils derived from loessal or Coastal Plain materials, the loessal material apparently predominating. The fairly large areas are closely associated with the Beechy and Shannon soils of bottom lands and the Briensburg and Eupora soils of colluvial lands. The native vegetation was chiefly deciduous forest having a large proportion of water-tolerant trees. A total of 787 acres of this soil was inundated by the Kentucky Reservoir after mapping had been completed.

The soil is strongly to very strongly acid, moderate to low in organic matter and plant nutrients, and high in water-holding capacity. It is permeable enough to allow good percolation of water, easy penetration of roots, and good circulation of air, but the water table is intermittently high and the subsoil is saturated during wet seasons. External drainage is very slow and internal drainage slow. The soil is free of stones or gravel.

Following is a profile description :

- 0 to 12 inches, grayish-brown to light-brown mellow silt loam; 8 to 16 inches thick.
- 12 to 30 inches, mellow silt loam mottled with gray, brown, and rust brown; 10 to 40 inches thick.
- 30 inches +, stratified layers of silt and sand highly mottled with gray, brown, and rust brown; 2 to 10 feet thick.

Present use and management.—About 60 percent of Hymon silt loam is cleared, and 65 percent of the cleared area is used for corn, about 20 percent for hay, chiefly lespedeza, and most of the rest for crops, as sorghum and cotton. If the spring months are very rainy a large part of the soil lies idle for the entire year. On most areas corn is grown year after year without fertilizer. Fertilization is not a common practice for any of the crops except the small acreage of cotton. About 25 bushels of corn, 200 pounds of cotton, and 1.2 tons of lespedeza hay are average acre yields under ordinary management.

Use and management requirements.—The use suitability of Hymon silt loam is somewhat limited by imperfect drainage and susceptibility to flooding. It is well suited, however, to corn and to many hay and forage crops. Artificial drainage should broaden its use. Both open ditches and tile drains would be effective in improving the internal drainage, but they would not appreciably lessen the damage from flooding.

The productivity of this soil has been lowered by continuously growing soil-depleting crops. Crop rotation and fertilization are needed to increase crop yields. The rotation can be short, but it should include a legume turned under to supply needed nitrogen. For high yields of most crops, lime, phosphate, and possibly potash are needed. A complete fertilizer is needed for cotton, but the nitrogen is not so badly needed for this crop as for others. Under good management about 35 bushels of corn, 320 pounds of cotton, and 1.4 tons of lespedeza hay are average acre yields.

Hymon fine sandy loam.—This imperfectly drained soil of the bottom lands is scattered throughout the sandy Coastal Plain sections and along the larger streams flowing from them. It has formed from mixed general alluvium washed from upland soils derived from

loess and Coastal Plain sand and clay, the sandy material predominating. It occurs on nearly level flood plains in fairly large areas associated with Shannon, Beechy, and other Hyman soils. The deciduous forest vegetation includes a high proportion of water-tolerant trees. A small area (87 acres) has been covered by the Kentucky Reservoir.

The soil is strongly to very strongly acid and moderate to low in organic matter and plant nutrients. It is permeable, but the water table is intermittently high and the water-holding capacity is high. External and internal drainage are slow. The soil is variable in sandiness but relatively free of stones or gravel.

Following is a profile description:

- 0 to 12 inches, grayish-brown or light-brown loose fine sandy loam; 8 to 16 inches thick.
- 12 to 30 inches, fine sandy loam or silt loam mottled with gray, brown, or rust brown; 10 to 40 inches thick.
- 30 inches +, stratified layers of sand and silt highly mottled with gray and rust brown; 2 to 10 feet thick.

Present use and management.—About 60 to 70 percent of Hyman fine sandy loam is cleared and used for crops or pasture. About 60 percent of the cleared area is used for corn, 20 percent for hay, 5 percent for cotton, and the rest for miscellaneous crops or idle land. Corn is grown year after year on most of the soil. Fertilizer is seldom used, except for cotton, and the quantities applied are inadequate. About 22 bushels of corn and 1.1 tons of lespedeza hay are average acre yields under ordinary management.

Use and management requirements.—The use suitability of Hyman fine sandy loam is somewhat limited by imperfect drainage and susceptibility to flooding. It is well suited to corn, however, and to most hay and forage crops. Open ditches or tile drains should be effective in improving internal drainage and would therefore broaden the use suitability. The management requirements are similar to those of Hyman silt loam.

Lax silt loam, rolling phase.—This moderately well-drained upland siltpan soil is underlain at a depth of 2 to 4 feet by partly cemented gravel. It has developed from a thin wind-blown silt layer on 5- to 12-percent slopes and has a deciduous forest cover consisting chiefly of oaks and hickory. Areas occur on high narrow ridge crests in the northern part of the cherty limestone hill section, chiefly in the vicinity of Mount Carmel Church. It is one of the most extensive soils in the Lax-Guin-Cuthbert soil association (see pl. 9).

The surface and subsoil layers are free of gravel, but the siltpan may contain considerable quantities, and the material below the siltpan is very gravelly. The soil is low in plant nutrients, organic matter, and water-holding capacity. It is strongly to very strongly acid. The surface and subsoil layers are permeable to air, roots, and water, whereas the siltpan is only slightly permeable.

Following is a profile description:

- 0 to 8 inches, yellowish-gray mellow silt loam; 6 to 10 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 24 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.
- 40 inches +, gravel, weakly cemented with silty soil material; 1 to 10 feet thick.

Variations occur in thickness of the gravel-free silt layer and in the thickness and degree of compaction of the siltpan. A few small well-drained areas are included that do not have a siltpan. Also a small acreage is included that has 2- to 5-percent slopes. The total acreage of these variations and inclusions is small and does not greatly influence use and management.

Present use and management.—Practically all of Lax silt loam, rolling phase, is in forest, chiefly chestnut, post, and blackjack oaks, although other oaks and hickory are common. The trees in the present stand are small, with a high percentage of poor quality, owing partly to selective cutting-over, slow tree growth, fire, and grazing.

Use and management requirements.—Lax silt loam, rolling phase, is physically suited to most of the common crops. Chiefly because of low fertility, restricted drainage, and low water-holding capacity, the soil is low in natural productivity and somewhat limited in use suitability. It is on narrow winding ridge crests associated with soils unsuited to crop production and consequently is probably best left in forest unless associated with other crop-adapted soils. The soil is highly susceptible to injury from erosion when cleared of its forest cover. On cleared areas management is concerned chiefly with maintaining or increasing productivity and with preventing erosion.

Lax silt loam, eroded rolling phase.—This moderately well-drained siltpan soil is underlain at a depth of about 3 feet by a weakly cemented gravel layer. The parent material is wind-blown silt. This soil is mainly on ridge crests on 5- to 12-percent slopes in the northern and northeastern parts of the cherty limestone hill section. The largest acreage is in the vicinity of Mount Carmel Church closely associated with Guin, Cuthbert, Bodine, and other Lax soils. The deciduous forest vegetation is chiefly oak.

Much of the original surface soil has been lost through erosion. The surface soil is not evenly removed, however, and within any delineated area the thickness of the layer may range from 0 to 8 inches. There has been some mixing of the subsoil with remnants of the original surface soil, but in most places the original surface layer constitutes the plow layer. A few severely eroded spots are common and conspicuous because of the exposed subsoil.

The surface and subsoil layers are free of gravel, but the siltpan may contain considerable quantities and the material below the siltpan is very gravelly. The soil is low in plant nutrients, organic matter, and water-holding capacity. It is strongly to very strongly acid. The surface soil and the subsoil are permeable to air, roots, and water; the siltpan is only slightly permeable.

Following is a profile description:

- 0 to 6 inches, yellowish-gray to grayish-yellow mellow silt loam; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 22 to 38 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.
- 38 inches +, gravel, weakly cemented with silt; 1 to 10 feet thick.

In adjacent areas are a few small well-drained areas having no siltpan. These are included with this separation, chiefly because of their insignificant acreage.

Present use and management.—Practically all of Lax silt loam, eroded rolling phase, is cleared and has been used for such common field crops as corn, cotton, cowpeas, and lespedeza. At present, an estimated 50 percent is idle, 25 percent is in unimproved pasture, and the rest is used for crops. The soil is very poorly managed—crops are not rotated systematically and fertilization is not commonly practiced. Under the usual management practices about 14 bushels of corn, 200 pounds of cotton, and 0.6 ton of lespedeza hay are average acre yields.

Use and management requirements.—Lax silt loam, eroded rolling phase, is well suited physically to the common crops, but the yields are low. It is similar to Dulac silt loam, eroded undulating phase, in use and management requirements but is more susceptible to erosion. Consequently, the rotation should be longer and should include as many close-growing crops as feasible. Cultivation should be on the contour; and, if the slopes are long, contour strip cropping may be advisable. Terraces may aid in controlling runoff, but the practicability of terracing siltpan soils is questionable since it is ineffective unless used in connection with other good management practices.

Lax silt loam, eroded undulating phase.—This is a moderately well-drained siltpan soil, underlain at a depth of about 3 feet by a weakly cemented gravel layer, with parent material of wind-blown silt. The soil is on the broad ridge crests on 2- and 5-percent slopes in the northern part of the cherty limestone hill section of the county. The largest acreage is in the vicinity of Mount Carmel Church. It is in the Lax-Guin-Cuthbert soil association. The deciduous forest vegetation is chiefly oak.

Part of the surface layer has been removed by erosion. Thus the thickness of the original layer has been materially reduced, and in many places the plow layer includes a part of the subsoil. Exposure of the subsoil makes small severely eroded spots common and conspicuous. The quantity of subsoil mixed with the surface soil has not significantly changed the texture except in very small areas.

The soil is strongly to very strongly acid, low in plant nutrients and organic matter, and low in water-holding capacity. The surface soil and subsoil are permeable to air, roots, and water; the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description :

- 0 to 6 inches, grayish-yellow to yellowish-gray mellow silt loam; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 22 to 40 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 22 inches thick.
- 40 inches +, gravel, weakly cemented with silt; 1 to 10 feet thick.

Present use and management.—Lax silt loam, eroded undulating phase, has been cleared and used for corn, cotton, cowpeas, lespedeza, and other crops. About 40 percent is idle and 25 percent in unimproved pasture. The rest is in miscellaneous crops, none of which are adequately fertilized or systematically rotated. Under common management practices about 16 bushels of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay are average acre yields.

Use and management requirements.—Lax silt loam, eroded undulating phase, though naturally low in productivity, is well suited physically to most field crops common to the area. Yields can be increased considerably by using a crop rotation that includes legumes and by proper and adequate fertilization. Phosphate, nitrogen, and potash are needed for most crops. The legume crops require lime but nitrogen should not be needed for them on the crop immediately following. Potash is especially needed for cotton and deep-rooted legumes. Winter cover crops, as crimson clover or vetch, should follow intertilled crops. They will not only aid in control of erosion but also add valuable nitrogen and organic matter. Special practices for erosion control are not necessary if other good management practices are followed. Under good management about 25 bushels an acre of corn, 380 pounds of cotton, and 1.3 tons of lespedeza hay can be expected.

Lax silty clay loam, severely eroded rolling phase.—This severely eroded moderately well-drained siltpan soil of the uplands has slopes of 5 to 12 percent. It developed from a thin layer of wind-blown silt underlain at a depth of about 3 feet by a weakly cemented layer of gravel. Areas occur on ridge crests and upper ridge slopes in the northern and northeastern part of the cherty limestone hill section. The soil is associated with Guin, Bodine, Cuthbert, and other Lax soils.

Most of the original surface soil has been lost through erosion, and in many places shallow gullies have penetrated the subsoil. The present surface layer is largely a mixture of subsoil and remnants of the original surface layer. Sheet erosion has usually been less severe than gullyng. Closely spaced shallow gullies and intergully areas that retain much of the original surface soil are characteristic.

The soil is strongly to very strongly acid, low in organic matter and plant nutrients, and low in water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable. The upper part of the soil is free of gravel, the siltpan may be gravelly in some places, and the material below the siltpan is very gravelly.

Following is a profile description :

- 0 to 4 inches, grayish-yellow to brownish-yellow friable silty clay loam; 0 to 6 inches thick.
- 4 to 20 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 20 inches thick.
- 20 to 36 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 12 to 20 inches thick.
- 36 inches +, gravel, weakly cemented with silt; 1 to 10 feet thick.

Present use and management.—All of Lax silty clay loam, severely eroded rolling phase, is cleared and has been used for crops, but most of it is now idle or used for unimproved pasture. A small part is used for crops. Both crop and pasture yields are very low.

Use and management requirements.—Lax silty clay loam, severely eroded rolling phase, is low in productivity of both crops and pasture. It is difficult to reforest, and tree growth is extremely slow. The soil is probably best used for pasture, but the yields are low even under good management, except in wet seasons. Lime, phosphate, and probably potash are necessary to establish and maintain a fair pasture.

If it is necessary to use this soil for crops, the rotation should be long

and should consist chiefly of close-growing crops, as grasses and deep-rooted legumes. Fertilizer is essential for all crops. Cultivation should be on the contour, and, if the slopes are long, contour strip cropping may be advisable.

Lexington-Ruston complex, hilly phases.—This separation includes areas on which the soils of the Lexington and Ruston series are so intricately associated that it is impractical to separate them. The Lexington soils are derived from a thin layer of wind-deposited silt; the Ruston, from loose unconsolidated sand. The complex is on 12- to 25-percent slopes in the sandy Coastal Plain section of the county, chiefly in the Ruston-Providence-Savannah soil association. The largest acreage is in the vicinity of Sawyers Mill. It is associated chiefly with Providence and Ruston soils of the uplands, Eupora soil of colluvial lands, and Hymon and Beechy soils of bottom lands. The forest vegetation is deciduous.

The soils of this complex are strongly to very strongly acid, moderate in organic-matter content and plant nutrients, and moderately low in water-holding capacity. They are permeable to extremely permeable to air, roots, and water. External and internal drainage are rapid.

Following is a profile description of each of the soils represented in the complex:

Lexington silt loam:

0 to 8 inches, grayish-brown mellow silt loam; 6 to 10 inches thick.

8 to 28 inches, yellowish-brown to reddish-brown friable silty clay loam; 16 to 22 inches thick.

28 inches +, brownish-red very friable fine sandy clay loam grading into fine sandy loam or sand; 5 feet or more thick.

Ruston fine sandy loam:

0 to 14 inches, yellowish-gray to grayish-yellow loose fine sandy loam to loamy fine sand; 12 to 16 inches thick.

14 to 26 inches, reddish-brown to brownish-red very friable fine sandy clay loam; 12 to 16 inches thick.

26 inches +, brownish-red very friable to loose fine sandy clay loam to fine sandy loam lightly splotched and streaked with gray and yellow in some places; 5 feet or more thick.

As to pattern and characteristics this complex is variable. A considerable acreage is included that is essentially a Ruston-Providence complex. The soil developed from the silt has a profile similar to that of Providence soils. The variations and inclusions do not differ greatly in use and management requirements.

Present use and management.—Practically all of Lexington-Ruston complex, hilly phases, has a deciduous forest cover. Although the forest consists chiefly of oak, it includes some yellow-poplar and chestnut. Most of the forest has been cut-over recently, and the present small stand includes many cull trees. Timber growth is moderately rapid, however, as compared with that on the Lax and Dulac soils.

Use and management requirements.—The hilly phases of Lexington-Ruston complex are very poorly suited to crops or pasture, chiefly because of steepness of slope and extreme susceptibility to erosion. Their best use is probably for forest. If it is necessary to use them for pasture they should be sown to a heavy sod-forming mixture soon after clearing. To obtain good sod and good pasture, lime and phosphate should be used and grazing should be carefully controlled so

as not to injure the sod. Thin places in the sod should be fertilized or manured and reseeded as soon as possible.

Lexington-Ruston complex, severely eroded hilly phases.—This separation includes closely associated severely eroded soils of the Lexington and Ruston series. They are on 12- to 25-percent slopes, but most of the acreage is in the lower part of the slope range. The Lexington soils are derived from a thin layer of wind-deposited silt; the Ruston, from loose unconsolidated sand. This separation is in the sandy Coastal Plain section, chiefly in the Ruston-Providence-Savannah soil association.

The soils of this complex are severely eroded. Most of the original surface soil and, in places, part of the subsoil have been removed. Shallow gullies are common, and an occasional deep V-shaped gully is present. Exposures of subsoil are common, and the red color makes them conspicuous. The texture of the surface soil is somewhat heavier than on the uneroded soils.

These soils are strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. They are permeable to extremely permeable to air, roots, and water. Both internal and external drainage are rapid.

A description of each representative profile follows:

Lexington silty clay loam:

0 to 4 inches, light-brown to yellowish-brown friable silt loam to light silty clay loam; 0 to 6 inches thick.

4 to 24 inches, yellowish-brown to reddish-brown friable silty clay loam; 16 to 22 inches thick.

24 inches +, brownish-red very friable fine sandy clay loam, grading into fine sandy loam or sand; 5 feet or more thick.

Ruston fine sandy clay loam:

0 to 6 inches, grayish-yellow to reddish-brown very friable light fine sandy clay loam; 0 to 8 inches thick.

6 to 18 inches, reddish-brown to brownish-red very friable fine sandy clay loam; 12 to 16 inches thick.

18 inches +, brownish-red very friable to loose fine sandy clay loam to fine sandy loam, grading into sand at about 4 feet; 5 feet or more thick.

This complex includes a few areas of siltpan soils similar to the Providence soils and also a few areas not so severely eroded as the complex. These inclusions do not differ significantly in use and management requirements.

Present use and management.—All of Lexington-Ruston complex, severely eroded hilly phases, has been cleared and used for crops or pasture, but most of it is now abandoned. A small acreage is in unimproved pasture; little is cropped. When first cleared the soil was not suited to intertilled crops but was fairly productive. For this reason it was planted to row crops until most of the soil material was lost by erosion. When the yields became unprofitably low, this complex was abandoned or put in pasture. The natural vegetation was not adequate to check erosion; consequently, the soils have become more severely eroded since being abandoned.

Use and management requirements.—The severely eroded hilly phases of the Lexington-Ruston complex are best suited to forest in their present condition. Some preparation preliminary to reforestation, as constructing diversion ditches and check dams in the gullies, mulching, and fertilizing, will be needed. Both pine and black locust do well on these soils, especially if phosphate is applied.

Lindside silt loam.—This imperfectly drained young soil of first bottoms occurs in long narrow strips along the Tennessee River. It has formed on nearly level or slightly depressional areas and consists of mixed recent alluvium washed chiefly from upland soils some of which are derived from limestone. It is intermediate in drainage, has associated characteristics between those of the well-drained Huntington and the poorly drained Melvin soils, and generally occurs in association with these and the Wolftever soils of low terraces. The forest cover is water-tolerant trees. Since mapping, 1,640 acres have been inundated by the Kentucky Reservoir.

The soil is medium acid and high in content of organic matter, plant nutrients, and water-holding capacity. It is imperfectly drained, and the highly mottled subsoil indicates that the water table is alternately high and low. External drainage is very slow and internal drainage slow to very slow. The soil is generally free of gravel throughout the profile.

Though this soil is without a well-developed textural profile, the following can be considered representative:

0 to 12 inches, brown or grayish-brown friable silt loam; 10 to 18 inches thick.

12 inches +, friable silt loam or heavy silt loam highly mottled with gray, brown, and rust brown; 2 to 10 feet thick.

Present use and management.—About 60 percent of Lindside silt loam is cleared and used for crops. The use and management are similar to those for associated Huntington soils, but yields average lower and occasionally the crops drown-out. Most of the soil is in corn almost continuously, with only an occasional cane or hay crop, usually lespedeza and soybeans. Corn yields are relatively high under favorable conditions, but low in wet seasons.

Use and management requirements.—The use suitability of Lindside silt loam is limited by imperfect drainage and susceptibility to flooding. Artificial drainage would not greatly broaden the use suitability, because the soil cannot be protected from flooding, but it would increase the average crop yields. The soil is well suited to corn, sorghum cane, and many of the summer-annual hay crops. Fertilization is not generally needed, because the supply of organic matter and plant nutrients is periodically replenished by fresh accumulations of sediment deposited by the flood waters. Under good management practices 25 bushels of corn and 1.5 tons of lespedeza hay are average acre yields.

Lindside silty clay loam.—This imperfectly drained young soil of low first bottoms is on nearly level to slightly depressed areas. The forest vegetation is of water-tolerant trees. The soil consists of mixed recent alluvium washed from upland soils, some of which are derived from limestone. It occurs as long narrow sloughlike areas, associated chiefly with the Egam, Melvin, or Wolftever soils along the Tennessee River. Since mapping, 186 acres have been covered by the Kentucky Reservoir.

The soil is medium acid and high in content of organic matter, plant nutrients, and water-holding capacity. It is imperfectly drained. The water table is alternately high and low. External drainage is very slow and internal drainage slow to very slow. The soil is free of gravel in most places.

Following is a profile description:

- 0 to 12 inches, grayish-brown to brown moderately friable silty clay loam; 10 to 18 inches thick.
- 12 to 22 inches, brownish-gray moderately friable silty clay loam splotted with gray and rust brown; 6 to 14 inches thick.
- 22 inches +, slightly compact silty clay loam highly mottled with gray, rust brown, and yellow; 2 to 10 feet thick.

Present use and management.—An estimated 10 percent of Lindsides silty clay loam is cleared and used for crops. Corn is the main crop, although some lespedeza, soybeans, and cane also are grown. About 15 to 20 percent of the cleared land is idle each year. When the distribution of rainfall is favorable, crop yields are high; in wet seasons they are generally low, or the crops may be a complete failure.

Use and management requirements.—Lindsides silty clay loam is fairly well suited to corn, annual hay, and some other feed and forage crops, but its suitability for many crops is limited by imperfect drainage and susceptibility to flooding. Artificial drainage would probably increase the average crop yields but would not significantly broaden the use suitability. The tilth is poor, and the moisture range for tillage is narrow. The soil puddles if plowed wet, becomes hard upon drying, and clods badly if plowed when too dry. Management is concerned chiefly with the selection of adapted varieties of crops and with better and more timely tillage practices. Fertilization is not considered necessary in many places. Under good management an average of about 30 bushels an acre of corn can be expected.

Lobelville silt loam.—This imperfectly drained young soil of first bottoms is in small narrow areas along the larger streams. The general alluvium from which it is formed has washed from upland soils derived from cherty limestone, but in this county the alluvium includes a mixture of loess. Textural differences between the layers are due chiefly to accidents of deposition. It is closely associated with the Ennis soils of bottom lands, Greendale soils of colluvial lands, and Bodine, Mountview, and Dickson soils of the uplands. The deciduous forest vegetation consists largely of water-tolerant trees. Since mapping, 1,530 acres have been inundated by the Kentucky Reservoir.

In many places scattered chert fragments are in the upper part of the profile but not in sufficient quantity to interfere materially with cultivation. The lower layers are extremely variable in content of chert; sometimes they are very cherty. The soil is strongly to very strongly acid, moderately low in organic matter and plant nutrients, and high in water-holding capacity. It is porous and readily permeable when not saturated. The water table is alternately high and low. External drainage is very slow and internal drainage slow.

Following is a profile description:

- 0 to 12 inches, grayish-brown mellow silt loam; 8 to 16 inches thick.
- 12 to 25 inches, light-brown friable silt loam splotted with gray, rust brown, and yellow; 5 to 15 inches thick.
- 25 inches +, bluish-gray silty clay loam splotted with yellow and rust brown, grading into very cherty material; 2 to 10 feet thick.

Present use and management.—An estimated 60 percent of Lobelville silt loam is cleared and used for crops or pasture. About 40 percent of the cleared area is used for corn, 20 percent for lespedeza hay,

10 percent for miscellaneous crops, and 30 percent is pasture or idle land. Fertilizer is not generally used, and the crops are not systematically rotated. Under common management practices 20 bushels of corn and 0.8 ton of lespedeza are average acre yields.

Use and management requirements.—Lobelville silt loam is physically suited to crops, but periodic flooding and imperfect drainage limit the crops that are suitable. Artificial drainage increases the average crop yields but does not greatly broaden the use suitability, because of the susceptibility to flooding. Even with its present imperfect drainage the soil is suitable for corn, sorghum, lespedeza, soybeans, and many other hay and pasture crops. An occasional crop failure, however, is to be expected.

Although this soil probably does not respond so rapidly to proper fertilization and crop rotation as the Ennis soils with which associated, its productivity can be increased considerably. Lime and phosphates are needed, especially for the legume crops. Potash also is very likely necessary, although the need for this element varies considerably. The rotation can be short but should include a legume or legume-grass mixture. If a rotation cannot be conveniently followed, a moderately high level of productivity can be maintained by adequate fertilization, including a sufficient application of nitrogen. Under good management practices 30 bushels of corn and 1 ton of lespedeza hay are average acre yields.

Melvin silt loam.—This poorly drained gray soil of bottom lands occurs chiefly in long narrow depressional or sloughlike areas on the flood plain of the Tennessee River. A total of 5,943 acres has been inundated by the Kentucky Reservoir. The soil has formed from highly mixed general alluvium washed from upland soils derived from a wide variety of rock, including limestone. Areas are associated with Lindsides, Egam, Huntington, Wolftever, and Sequatchie soils. A small acreage is associated with the Ennis and Lobelville along the larger streams in the cherty limestone hill section. The native vegetation consisted largely of water-tolerant trees—willow, willow oak, tupelo gum, and cypress.

The soil is medium to strongly acid and apparently high in organic matter, plant nutrients, and water-holding capacity. The soil material is permeable, but as the water table is high, the soil is waterlogged during rainy seasons. It is free of gravel or stones in most places.

Following is a profile description:

- 0 to 6 inches, brownish-gray or gray friable silt loam or light silty clay loam spotted with light gray and rust brown; 4 to 8 inches thick.
- 6 to 18 inches, friable silt loam to silty clay loam highly mottled with gray, yellow, and rust brown; 10 to 20 inches thick.
- 18 inches +, bluish-gray silty clay loam; 2 to 10 feet thick.

A small included acreage has formed from alluvium washed chiefly from cherty limestone material. This inclusion is lighter in texture and more acid in reaction than the normal phase, and in most places contains chert fragments throughout the profile. The soils do not differ significantly in use and management requirements.

Present use and management.—Most of Melvin silt loam is still in forest, but a small part is cleared and used for crops and pasture. Some of the cleared land is used and managed like the associated Lindsides and Huntington soils, but most of it is too poorly drained

to be cultivated at the same time. It is used chiefly for wild hay, late corn, or sorghum. Crop production is very uncertain, and failures are common.

Use and management requirements.—In its present drainage condition, Melvin silt loam is unsuitable for crops requiring tillage but fairly well suited to pasture. If drained, the soil would probably be moderately to highly productive of corn, sorghum, and some hay crops. The use suitability would still be limited, however, by the susceptibility to flooding. The soil should drain well, as it is permeable throughout, but the feasibility of draining rests upon several factors, of which actual response to drainage is only one.

Mountview silt loam, rolling shallow phase.—This well-drained upland soil is developed on ridge crests or ridge slopes of 5 to 12 percent from a thin 10- to 20-inch layer of wind-blown silt underlain by cherty limestone residuum. The soil differs from Bodine cherty silt loam, rolling phase, chiefly in having a relatively chert-free plow layer and a well-developed profile; and from Dickson silt loam in having a thinner chert-free layer and in not having a siltpan. This soil is in small areas throughout the cherty limestone hill section, generally in the less highly dissected parts. It is closely associated with Dickson, Greendale, Bodine, and other Mountview soils. The forest vegetation is deciduous.

The soil is strongly to very strongly acid, apparently low in organic matter and plant nutrients, and fairly low in water-holding capacity. It is permeable to air, roots, and water. External and internal drainage are moderate. The soil is relatively chert-free to a depth of about 15 inches, but below this the subsoil contains numerous angular chert fragments.

This phase is transitional in many characteristics between Bodine cherty silt loam and Dickson silt loam, and geographically it is between these soils in many places. Consequently, many areas of Bodine cherty silt loam include small areas of these soils.

Following is a profile description:

- 0 to 8 inches, grayish-yellow to yellowish-gray mellow silt loam; 6 to 12 inches thick.
- 8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam, changing gradually to cherty silty clay loam in the lower part; 10 to 20 inches thick.
- 24 inches +, very cherty silty clay loam highly mottled with red, yellow, gray, and brown; 5 feet thick or more.

Present use and management.—Practically all of Mountview silt loam, rolling shallow phase, is still in forest, chiefly oak. The forest has been cut over and there is very little marketable timber at present. Timber grows slowly, and the yields are low.

Use and management requirements.—The rolling shallow phase of Mountview silt loam is physically fairly well suited to crops, but a large part is in long narrow areas isolated by large areas of Bodine cherty silt loam, steep phase. The cleared areas are highly susceptible to great injury from erosion. A long rotation of close-growing crops, including grasses and legumes, is desirable. Lime, phosphate, and potash are needed for most crops, and nitrogen for all crops except the legume and the crop immediately following. Special practices for runoff and erosion control should not be necessary if a long rotation

is used. Row crops, however, should be on the contour. Terraces may be necessary on some of the ridge slopes but not on the crests.

Mountview silt loam, eroded rolling shallow phase.—This well-drained soil developed from a very thin layer of loess over cherty limestone residuum on slopes of 5 to 12 percent under a deciduous forest vegetation. This separation is mainly on the ridge slopes below phases of Dickson silt loam in the less dissected parts of the cherty limestone hill section. Some areas, however, are on ridge crests associated with phases of Bodine cherty silt loam. The chert-free layer is thinner, and in some places, scattered chert fragments may be on the surface and in the plow layer.

Part of the original surface soil has been lost as a result of erosion. The thickness of the remaining surface soil is variable, and small areas of exposed subsoil are common. In more eroded areas some angular chert fragments are in the plow layer. The soil is permeable to air, roots, and water. Both internal and external drainage are moderate. This phase is apparently low in organic matter, plant nutrients, and water-holding capacity and strongly to very strongly acid.

Following is a profile description:

0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.

6 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam, grading into cherty silty clay loam; 10 to 20 inches thick.

24 inches +, cherty silty clay loam highly mottled with red, yellow, gray, and brown; 5 feet thick or more.

Some small areas included with this separation contain enough chert in the plow layer to interfere materially with cultivation. Other small areas included have a thicker chert-free layer than normal for this soil. These variations, however, do not significantly change the use and management requirements.

Present use and management.—All of Mountview silt loam, eroded rolling shallow phase, has been cleared and used for crop production. A large part is now used either for crops or for pasture, and the rest is in idle open land. Crops are not systematically rotated, and fertilizer is not commonly applied. Under common management practices acre yields of about 14 bushels of corn, 200 pounds of cotton, and 0.6 ton of lespedeza hay can be expected.

Use and management requirements.—The eroded rolling shallow phase of Mountview silt loam is considered suitable for crops though very susceptible to injury from erosion. It is low in organic matter and plant nutrients and strongly to very strongly acid. If it is used for crops, a long rotation including mostly close-growing crops is probably necessary. To protect the soil from further injury from erosion, it should not be left bare for extended periods but should be sown in a cover crop as soon as possible after the row crop is removed.

Lime, phosphate, and probably potash are needed for most crops. Nitrogen is needed for all crops except legumes and the crops immediately following. Good response is obtained from fertilization, but the effect does not last long. Cultivation should be on the contour, and contour strip cropping should be considered for long slopes. Terraces may be necessary in places to control runoff and erosion, but not if other management practices are adequate. Under good management corn yields average about 20 bushels an acre; cotton 320 pounds; and lespedeza hay, 1 ton.

Mountview silt loam, hilly shallow phase.—This well-drained soil, developed from a very thin layer of loess underlain by cherty limestone residuum, is widely distributed throughout the cherty limestone hill section of the county, though most of the acreage is in the less highly dissected parts. It is on ridge slopes of 12 to 25 percent, usually below Mountview silt loam, rolling shallow phase, or Dickson silt loam, undulating phase. It differs from the rolling shallow phase in having steeper slopes, a thinner chert-free layer, and less distinct surface and subsoil layers. The relatively chert-free layer averages about 10 inches thick, and some chert may be in the surface layer. The deciduous forest vegetation is chiefly oak.

This soil is strongly to very strongly acid, apparently low in organic matter and plant nutrients, and fairly low in water-holding capacity. It is permeable to air, roots, and water. Internal drainage is moderate and external drainage rapid. The surface layer may contain some chert, but not enough to interfere materially with cultivation. In most places the subsoil contains numerous chert fragments.

Following is a profile description :

0 to 8 inches, grayish-yellow to yellowish-gray mellow silt loam; 6 to 12 inches thick.

8 to 20 inches, brownish-yellow friable light silty clay loam to cherty silty clay loam; 8 to 16 inches thick.

20 inches +, very cherty silty loam highly mottled with red, yellow, gray, and brown; 5 feet thick or more.

Present use and management.—Practically all of Mountview silt loam, hilly shallow phase, is in cut-over forest; the timber remaining is small and of poor quality. Timber growth is slow, and yields of marketable timber are low.

Use and management requirements.—The hilly shallow phase of Mountview silt loam is poorly suited to crops requiring tillage, chiefly because of low fertility and susceptibility to injury from erosion. It is not naturally productive of good pasture, but fair pasture can probably be established and maintained by good management. Lime, phosphate, and possibly potash are needed to establish and maintain a good pasture mixture; nitrogen also may be necessary in establishing the stand. If grazing is carefully controlled so as to maintain a good sod, other erosion control measures should not be necessary.

Mountview silt loam, eroded hilly shallow phase.—Like the hilly shallow phase, this soil has developed from a thin layer of loess underlain by cherty limestone residuum, but part of the surface soil, including the thin surface layer of high organic-matter content, has been lost through erosion. The slopes range from 12 to 25 percent. This phase is chiefly in the less highly dissected parts of the cherty limestone hill section, but in many places on ridge slopes below Mountview silt loam, eroded rolling shallow phase, or Dickson silt loam, eroded undulating phase.

The thickness of the present surface soil is variable, and small areas of exposed subsoil are common. The surface layer contains some chert fragments in the more eroded spots. The soil is permeable, with moderate internal and rapid external drainage. It

is low in organic matter, plant nutrients, and water-holding capacity, and it is strongly to very strongly acid.

Following is a profile description:

0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.

6 to 20 inches, brownish-yellow friable light silty clay loam to cherty silty clay loam; 8 to 16 inches thick.

20 inches +, cherty silt loam highly mottled with gray, yellow, red, and brown; 5 feet or more thick.

Present use and management.—All of Mountview silt loam, eroded hilly shallow phase, has been cleared and used for the common field crops, but most of it is now either idle or in pasture. The pastures are unimproved, and their carrying capacity is low. Crops are not systematically rotated, nor is fertilizer generally used on the small acreage used for crop production. In most places the soil is planted to corn or other intertilled crops until yields become very low; then it is either abandoned or fenced for pasture.

Use and management requirements.—The eroded hilly shallow phase of Mountview silt loam is apparently poorly suited to crop production, chiefly because of low fertility and susceptibility to erosion. With adequate fertilization, however, fair pasture can be established and maintained. Lime, phosphate, and potash are needed to establish a good pasture mixture, which should include clovers, but even so, nitrogen fertilizer is needed in most places to establish the stand.

Mountview silty clay loam, severely eroded rolling shallow phase.—This well-drained soil developed on slopes of 5 to 12 percent from a very thin layer of loess over cherty limestone residuum. Small areas are widely distributed throughout the cherty limestone hill section. The forest vegetation is deciduous.

Most of the original surface soil has been lost through erosion, and at present this layer consists of remnants of the original surface soil mixed with the upper part of the subsoil. The surface soil has not been uniformly removed, and in some places the plow layer may be entirely within it. The texture of the present surface layer consequently ranges from silt loam to silty clay loam. The loss of material has exposed the underlying cherty layers in many places, and shallow gullies that have penetrated the subsoil are common. This soil is strongly to very strongly acid, low in organic matter and plant nutrients, and very low in water-holding capacity.

Following is a profile description:

0 to 4 inches, grayish-yellow to brownish-yellow friable silt loam or silty clay loam; 0 to 8 inches thick.

4 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam, grading into cherty silty clay loam; 10 to 20 inches thick.

22 inches +, cherty silty clay loam highly mottled with red, yellow, gray and brown; 5 feet or more thick.

A few small areas included with this separation have sufficient chert fragments in the surface soil to interfere materially with cultivation. Some included areas have a thicker chert-free layer, and in some places this variation has a siltpan.

Present use and management.—All of Mountview silty clay loam, severely eroded rolling shallow phase, has been cleared and used for

crop production, although most of it is now either idle or in pasture. These unimproved pastures have a very low carrying capacity.

Use and management requirements.—The severely eroded rolling shallow phase of Mountview silty clay loam is poorly suited to crops but probably can be used for pasture with good management practices. To establish and maintain a good pasture mixture requires applications of lime, phosphate, and possibly potash. Manuring or mulching the more eroded areas aids in establishing the pasture mixture, which should include legumes. An application of nitrogen fertilizer is needed. Even with good management, the carrying capacity of the pasture will probably be low at the beginning, but after a period under a good management program, fertility will be improved and the physical properties so restored as to permit using the soil again for crops. When conditions permit such use, the management requirements are similar to those of Mountview silt loam, eroded rolling shallow phase.

Paden silt loam, undulating phase.—This moderately well-drained soil of the terraces developed on 2- to 5-percent slopes. The old general stream alluvium consists of a mixture of materials washed from upland soils derived from a wide variety of rock, including limestone. A thin layer of loess apparently covers the old alluvium, and the parent material consists of varying mixtures of the two. This phase is on high terraces along the Tennessee River, associated chiefly with Taft and Robertsville soils. The largest areas are in the vicinity of Eva and Claud. The forest vegetation is deciduous.

The soil is very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water, but the siltpan is only slightly permeable. External drainage is moderate, and internal drainage moderately low. The upper soil layers are free of gravel; the layer below the siltpan is gravelly in places.

Following is a profile description:

0 to 8 inches, yellowish-gray to grayish-yellow mellow silt loam; 6 to 10 inches thick.

8 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 22 inches thick.

24 to 42 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 16 to 20 inches thick.

42 inches +, moderately friable silty clay loam mottled red, brown, yellow, and gray; 2 to 10 feet thick.

A significant acreage of soil is included that differs in being moderately eroded but does not differ greatly in use and management requirements.

Present use and management.—Most of Paden silt loam, undulating phase, is in forest, chiefly oak. The cleared areas are used for pasture and for corn, cotton, peanuts, lespedeza, and other crops. These are not grown in any systematic rotation, however, nor are they adequately fertilized. The forest has been cut-over, and the present stand is small and includes many cull trees.

Use and management requirements.—The undulating phase of Paden silt loam is physically well suited to most of the common field crops, but low fertility and water-holding capacity make it only moderately productive. The use suitability is limited by slow internal

drainage. To maintain or increase productivity, a suitable rotation of crops and adequate fertilization are required. The rotation can be fairly short but should include a legume crop or a legume-grass mixture. A cover crop, preferably a legume, should follow all intertilled crops.

Lime, phosphate, and possibly potash are necessary for the legume crop, especially if it is a deep-rooted legume (pl. 3, *C*). Nitrogen is needed for all except the legume and the crop immediately following. A complete fertilizer is needed for cotton and grain crops. Owing to the low water-holding capacity of the soil, summer crops are often injured by drought. The small grains give proportionally higher yields, chiefly because they mature during the season of higher rainfall. Under good management practices 35 bushels of corn, 440 pounds of cotton, and 1.5 tons of lespedeza hay are average acre yields.

Paden silt loam, eroded rolling phase.—This is a moderately well-drained soil of terrace lands developed on 5- to 12-percent slopes. The parent material consists of varying mixtures of loess and old alluvium, most of it washed from upland soils underlain by a variety of rocks, including limestone. Small areas occur on high terraces along the Tennessee River, the largest in the vicinity of Eva and Claud. The soil is associated with Taft and Robertsville soils of terrace lands, Bodine soils of the uplands, and Lindside and Melvin soils of bottom lands. The forest vegetation is deciduous.

Most of the original surface soil has been removed by erosion. There has been some mixing of the subsoil with remnants of the original surface soil in the plow layer, but the original surface soil constitutes the plow layer over most of the areas. A few severely eroded spots are conspicuous because of the exposed subsoil.

The soil is very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are permeable to air, roots, and water; the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately low.

Following is a profile description:

- 0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.
- 6 to 22 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 22 inches thick.
- 22 to 28 inches, siltpan of compact silty clay loam mottled with gray, yellow, and brown; 14 to 20 inches thick.
- 38 inches +, moderately friable silty clay loam mottled red, brown, yellow, and gray; 2 to 10 feet thick.

Included are a few small areas that are severely eroded and a few that are uneroded.

Present use and management.—Practically all of Paden silt loam, eroded rolling phase, has been cleared and used for crops, about 20 percent for corn, 5 percent for cotton, 25 percent for hay and pasture, and 10 percent for miscellaneous crops, and 40 percent is idle. Crops are not rotated systematically nor is fertilizer commonly applied. Under common management practices, 16 bushels of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay are average acre yields.

Use and management requirements.—The eroded rolling phase of Paden silt loam is physically suited to most of the crops grown in the county but naturally low in productivity because of continuous crop-

ping and erosion. Management is concerned chiefly with increasing productivity and controlling erosion. A long rotation of close-growing crops, including legumes, is desirable. The soil is low in lime, phosphate, nitrogen, and potash, and applications of these are needed for high yields of most crops. A legume crop in the rotation will add valuable nitrogen and organic matter. A winter cover crop, preferably a legume, should follow all intertilled crops. Row crops should be planted on the contour. Terraces are an effective aid in runoff and erosion control, if used with other good management practices. Under good management, corn yields average about 25 bushels an acre; cotton, 380 pounds; and lespedeza hay, about 1.2 tons.

Providence silt loam, undulating phase.—This moderately well-drained siltpan soil developed on 2- to 5-percent slopes on the broader ridge crests in the relatively highly dissected sandy Coastal Plain section. The parent material consists of a thin layer of wind-blown silt underlain at a depth of about 3 feet by relatively permeable sandy material. Practically all this separation is in the western part of the county in the Ruston-Providence-Savannah soil association. Ruston soils are on the ridge slopes below the Providence soil in most places. The deciduous forest vegetation is chiefly oak.

The soil is strongly to very strongly acid and apparently low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water; the siltpan is only slightly permeable but is more so than the comparable layers in the Dulac and Tippah soils. External drainage is moderate and internal drainage moderately slow. The profile is free of stones or gravel.

Following is a profile description :

- 0 to 8 inches, yellowish-gray to grayish-yellow mellow silt loam; 6 to 10 inches thick.
- 8 to 28 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 24 inches thick.
- 28 to 42 inches, siltpan of brownish-yellow moderately compact silty clay loam to fine sandy clay loam spotted with yellow and gray; 8 to 14 inches thick.
- 42 inches +, brownish-yellow to reddish-brown sandy material streaked with gray and yellow; 2 to 10 feet thick.

Present use and management.—Practically all of Providence silt loam, undulating phase, is in forest, chiefly oak and hickory. All areas have been cut over one or more times. The present stand is small and includes many cull trees. Timber growth is slow, and production is reduced by frequent burning and grazing.

Use and management requirements.—The undulating phase of Providence silt loam is physically well suited to crops but is naturally low in productivity. Use suitability is somewhat limited by the restricted drainage and the low water-holding capacity. The soil is on narrow winding ridge crests surrounded by extensive areas of Ruston soils that in many places are unsuited to crops; consequently, it is not economically practicable to use this soil for crops or pasture in these locations. On soil cleared and used for crops, management practices are similar to those for the eroded undulating phase.

Providence silt loam, eroded undulating phase.—This moderately well-drained siltpan soil of the uplands has slopes of 2 to 5

percent on narrow ridge crests in sandy Coastal Plain sections and has developed from a thin layer of wind-blown silt underlain at a depth of about 3 feet by sandy Coastal Plain material. Areas are largely confined to the Ruston-Providence-Savannah soil association. The native vegetation consisted chiefly of red, white, blackjack, and post oaks.

Much of the original surface soil has been removed by erosion (pl. 5, A), the loss varying from very little in some areas to most of the layer in others. Exposure of the subsoil makes a few severely eroded spots conspicuous. There has been some mixing of the surface soil and subsoil in the plow layer, but neither the color nor the texture of the present layer has been significantly changed, except in the more severely eroded spots.

The soil is strongly to very strongly acid and apparently low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are permeable to air, roots, and water; the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow. The soil is free of stones and gravel throughout.

Following is a profile description :

0 to 6 inches, grayish-yellow mellow silt loam; 0 to 8 inches thick.

6 to 26 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 24 inches thick.

26 to 40 inches, siltpan of brownish-yellow moderately compact silty clay loam to fine sandy clay loam splotched with gray and yellow; 8 to 14 inches thick.

40 inches +, brownish-yellow to reddish-brown sandy material streaked with gray and yellow; 2 to 10 feet thick.

Present use and management.—All of Providence silt loam, eroded undulating phase, is cleared and used chiefly for corn, cotton, cowpeas, lespedeza and other field crops common to the area. The needs of the farmer rather than the needs of the soil determine which crop will be grown. The soil is in a locality that has a low proportion of crop-adapted soils and consequently is used intensively for row crops. Fertilization is not commonly practiced except for cotton. About 200 pounds of superphosphate or a 4-10-4 mixture is the usual application. Some lime and phosphate have been used in recent years on the legume crop. Under the usual management practices about 18 bushels of corn, 240 pounds of cotton, and 0.8 ton of lespedeza hay are average acre yields.

Use and management requirements.—Providence silt loam, eroded undulating phase, is physically well suited to most of the common crops, but its low natural fertility, restricted drainage, and low water-holding capacity somewhat limit use suitability and make its productivity moderately low. Productivity can be maintained at a much higher level by adequate fertilization and by a rotation that includes legumes and grasses. The soil can probably be maintained under a rotation of moderate length that does not include more than one row crop in 4 years.

Deep-rooted legumes are grown more successfully here than on the Dulac and Tippah soils, but lime, phosphate, and possibly potash are necessary to establish and maintain these crops. Nitrogen is needed for all except the legume crop and the one immediately following, and phosphate for all. Potash is needed especially for cotton and for most other crops except possibly corn. Well-fertilized winter cover

crops, preferably legumes, should follow all intertilled crops. Special measures for runoff and erosion control should not be necessary if other good management practices are followed. Under good management about 30 bushels of corn, 400 pounds of cotton, and 1.4 tons of lespedeza hay are average acre yields.

Providence silt loam, rolling phase.—This moderately well-drained siltpan soil of the uplands has a slope range of 5 to 15 percent but mostly is on slopes of less than 10 percent. It is on narrow ridge crests in the highly dissected parts or on ridge slopes in the less dissected parts of the sandy Coastal Plain. The parent material consists of a thin layer of wind-blown silt underlain at a depth of about 3 feet by relatively permeable sandy Coastal Plain material. This phase is confined largely to the Ruston-Providence-Savannah soil association. The forest cover consists chiefly of oak and hickory.

The soil is strongly to very strongly acid and apparently low in organic matter, plant nutrients, and water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water; the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow. The soil is free of stones or gravel.

Following is a profile description :

- 0 to 8 inches, yellowish-gray to grayish-yellow mellow silt loam ; 6 to 10 inches thick.
- 8 to 28 inches, yellowish-brown to brownish-yellow friable silty clay loam ; 16 to 24 inches thick.
- 28 to 40 inches, siltpan of brownish-yellow moderately compact silty clay loam to fine sandy loam ; 6 to 14 inches thick.
- 40 inches +, brownish-yellow to reddish-brown sandy material streaked with gray and yellow ; 2 to 10 feet thick.

Present use and management.—Practically all of Providence silt loam, rolling phase, is in cut-over forest of red, white, blackjack, and post oaks and pignut hickory. Timber growth is slow, and the present small stand includes many cull trees.

Use and management requirements.—Chiefly because of its stronger slopes, the rolling phase of Providence silt loam is inferior to the undulating phase for cultivation though physically suitable for most of the common field crops. Most areas are more inaccessible than those of the undulating phase—a large part is on very narrow ridge crests surrounded by extensive areas of steep Ruston soils. If cleared, the soil is more susceptible to accelerated erosion and requires more careful management to prevent erosion. It would require a longer rotation than the undulating phase and one including more close-growing crops. Fertilization needs and management requirements would be similar to those of the eroded rolling phase.

Providence silt loam, eroded rolling phase.—This moderately well-drained siltpan soil of the uplands is developed from a thin silt layer underlain by sandy Coastal Plain material at a depth of about 3 feet. It is mainly on ridge crests in the highly dissected sandy Coastal Plain section and is confined almost entirely to the Ruston-Providence-Savannah soil associations. Slopes range from 5 to 12 percent but are mostly less than 10 percent. The deciduous forest vegetation is chiefly oak and hickory.

Most of the original surface soil has been lost through erosion. The original layer has been unevenly removed, however, and the present one is variable in thickness. Small severely eroded spots are

common and conspicuous, owing to exposure of the subsoil. There has been some mixing of the surface soil and subsoil material in the plow layer, but the texture of the present surface layer is not materially heavier, except in the more severely eroded spots.

The soil is strongly to very strongly acid and apparently low in organic matter, plant nutrients, and water-holding capacity. The surface soil and subsoil are permeable to air, roots, and water; the siltpan is only slightly permeable. External drainage is moderate and internal drainage moderately slow.

Following is a profile description:

- 0 to 6 inches, grayish-yellow mellow silt loam; 0 to 6 inches thick.
- 6 to 26 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 24 inches thick.
- 26 to 38 inches, siltpan of brownish-yellow moderately compact silty clay loam to fine sandy clay loam spotted with yellow and gray; 6 to 14 inches thick.
- 38 inches +, brownish-yellow to reddish-brown sandy material streaked with red and yellow; 10 to 20 feet thick.

Present use and management.—All areas of Providence silt loam, eroded rolling phase, have been cleared and many are being used for crops, about 25 percent being idle. Corn, cotton, cowpeas, and lespedeza, the principal crops, are not systematically rotated. Instead, the needs of the farmer largely determine which crop will be grown. Fertilization is not a common practice, although cotton is lightly fertilized in most places. Lime and phosphate are used on the hay crop, but not in adequate quantity. Under common management practices about 16 bushels of corn, 220 pounds of cotton, and 0.7 ton of lespedeza are average acre yields.

Use and management requirements.—The eroded rolling phase of Providence silt loam is physically suited to most of the common crops. Low fertility, restricted internal drainage, and low water-holding capacity somewhat limit its use suitability, and make it naturally low in productivity. Because of the thinner, more permeable siltpan, the soil is highly susceptible to erosion, but less so than the Dulac soils.

A moderately long rotation, chiefly of close-growing crops and including legumes and grasses, is well suited. Deep-rooted legumes, as alfalfa, sericea lespedeza, and sweetclover, are expected to be less difficult to establish and maintain than on the Dulac soils because this phase has a more permeable siltpan and slightly better drainage. All the major fertilizing elements are probably needed for most crops, but the quantity and content of the fertilizer depends to a great extent on the crops grown and their sequence in the rotation. Cultivation should be on the contour, and if slopes are long, contour strip cropping may be advisable. Terraces may be necessary to control runoff and erosion, especially if many row crops are grown.

Providence silty clay loam, severely eroded rolling phase.—This moderately well-drained siltpan soil of the uplands developed from a thin layer of wind-blown silt underlain at a depth of about 3 feet by sandy Coastal Plain material. This soil is chiefly on ridge slopes in the less dissected parts of the sandy Coastal Plain section and is in the Ruston-Providence-Savannah soil association. The slopes range from 5 to a maximum of 15 percent, most of them less than 12 percent.



A, Gully erosion on Providence soils.

B, Deeply weathered cut of Devonian chert; the surface layer of Dulac silt loam, eroded rolling phase, consists of about 36 inches of loess underlain by about 4 feet of Coastal Plain material.



- A, Cotton growing on Ruston fine sandy loam, eroded hilly phase.**
B, Landscape of the Dulac-Savannah-Briensburg soil association, showing the undulating to rolling relief.
C, Landscape of the Ruston-Providence-Savannah soil association characterized by short steep slopes and narrow V-shaped valleys.

Severe erosion has removed most of the original surface layer and, in places, a part of the subsoil. Shallow gullies are common, and a few have cut through the siltpan and are not crossable by heavy farm machinery. Shallow gullies that have cut into the subsoil are characteristic as also are intergully areas that still have a large part of the original surface soil. Mixing the remnants of the surface soil and the upper part of the subsoil in the plow layer has resulted in the heavier texture of the present surface layer over most areas.

The soil is strongly to very strongly acid and is apparently very low in organic matter, plant nutrients, and water-holding capacity. The upper horizons are permeable to air, roots, and water; the siltpan is only slightly permeable.

Following is a profile description:

- 0 to 4 inches, grayish-yellow to brownish-yellow friable silt loam to silty clay loam; 0 to 6 inches thick.
- 4 to 24 inches, yellowish-brown to brownish-yellow friable silty clay loam; 16 to 24 inches thick.
- 24 to 36 inches, siltpan of brownish-yellow moderately compact silty clay loam to fine sandy clay loam splotted with yellow and gray, 6 to 14 inches thick.
- 36 inches +, brownish-yellow to reddish-brown sandy material streaked with red and yellow; 2 to 10 feet thick.

Present use and management.—All of Providence silty clay loam, severely eroded rolling phase, has been cleared and used for crops and pasture, but most of it is now idle or abandoned. Most of the very small areas used for crops and unimproved pasture are parts of less severely eroded larger fields. Crop and pasture yields are extremely low.

Use and management requirements.—Providence silty clay loam, severely eroded rolling phase, has been severely injured by erosion and in its present condition it is considered unsuitable for crops and very poorly suited to pasture. It is difficult to reforest, and under natural conditions the forest cover establishes itself very slowly. Under present conditions the soil can probably be best used for pasture. Fertilizer and lime are required to obtain fair pasture; and phosphate, potash, and probably nitrogen to establish the sod. The soil should be seeded to heavy sod-forming pasture plants, including legumes. Grazing should be regulated so as to maintain a good sod at all times.

Robertsville silt loam.—This poorly drained gray soil is confined largely to the terraces of the Tennessee River and to a few areas on low terraces along the tributary streams. The old alluvium from which it developed has been washed from soils of the uplands underlain by a wide variety of rock, including limestone. The soil has developed on nearly level to slightly depressed areas. It is in the Huntington-Egam-Wolftever soil association, closely associated with Wolftever, Taft, Paden, and Egam soils and with the Humphreys soils on the tributary streams. The forest cover is of water-tolerant trees. Since mapping, 1,159 acres have been inundated by the Kentucky Reservoir.

The soil is very strongly acid and apparently low in organic matter and plant nutrients. The highly mottled gray profile indicates that the water table is high much of the time. The relatively impermeable compact layer greatly retards or almost prohibits passage of water.

The surface soil and subsoil are permeable to air, roots, and water in the dry periods, when they are not saturated by the high water table. The soil is free of gravel in most places, but the part associated with the Humphreys soils contains some water-worn chert. External drainage is slow to very slow.

Following is a profile description:

- 0 to 10 inches, gray mellow silt loam spotted with rust brown; 8 to 12 inches thick.
- 10 to 22 inches, friable silty clay loam mottled with gray, yellow, and rust brown; 14 to 18 inches thick.
- 22 to 40 inches, siltpan or claypan of compact gray to bluish-gray heavy silty clay spotted with yellow and rust brown; 18 to 20 inches thick.
- 40 inches +, moderately friable silty clay loam mottled gray and yellow; 2 to 10 feet thick.

Profile characteristics are variable. The soil associated with Humphreys along the small streams differs chiefly in having a lighter texture and a weak siltpan. Some areas on the low terrace of the Tennessee River have a claypan rather than a siltpan. The thickness of the surface layer is variable and is influenced by additions of recent alluvium in many places. All these variations and inclusions are poorly drained, however, and do not significantly influence the use of the soil.

Present use and management.—Most of Robertsville silt loam is in forest of willow oak, willow, cypress, sweetgum, blackgum, and other water-tolerant trees. About 40 percent of the soil has been cleared, but most of this is idle or has a cover of second-growth brush. A few areas are used for crops, but the yields are low and extremely variable. The cropped areas are managed like the associated Wolftever or Paden soils. The usual management practices are not adapted to this soil.

Use and management requirements.—Robertsville silt loam is too poorly drained for the production of most of the common crops. It is fairly well suited to a few crops, particularly those having a short growing season that can be planted late in spring, as sorghum cane and soybeans. Lespedeza does fairly well on areas that have fair surface drainage. The soil is suited to pasture but is not very productive of pasture plants. It is not in areas large enough to be fenced separately, as it is chiefly in long narrow bodies surrounded by soils that are being used for crop production.

Surface drainage with open ditches would broaden the use suitability to some extent and increase the average production of certain forage crops and pastures. Because of the relatively impermeable compact layer, tile drainage would probably be ineffective in significantly improving drainage conditions. The application of lime, phosphate, and potash would improve the pasture, but moisture conditions would restrict the response.

Rough gullied land (Cuthbert soil material).—This land type is characterized by a close network of gullies that have largely destroyed the former soil layers, which consisted of Cuthbert fine sandy loam or other soils underlain by Coastal Plain clay or sandy clay. The clay or sandy clay soil material exposed is highly mottled with red, yellow, and gray. Many areas were covered by a thin loessal mantle, remnants of which include the siltpan of such soils as the Dulac and

Tippah. This land type has slopes of 5 to 30 percent. It is in very small areas, chiefly in the Dulac-Savannah-Briensburg, Ruston-Providence-Savannah, and Safford-Cuthbert-Ruston soil associations.

Practically all this land is abandoned. A few areas have been reforested, but much of it is covered with a sparse growth of wild grasses or scrub trees. A large part is devoid of vegetation of any kind and has very little value to the owners. In fact, in its present condition it is a liability, inasmuch as the present sparse vegetation is not effective in checking active erosion, and adjacent uneroded uplands will be encroached upon by headward cutting of gullies. Nearby colluvial and bottom lands will have their productivity reduced by the accumulations of heavy infertile subsoil materials deposited over them. This land type is unsuited to crops or pasture and is extremely difficult to reforest. Considerable advance preparation, including fertilization, is needed to establish trees.

Rough gullied land (Ruston soil material).—This land type consists of a close network of gullies that have largely destroyed the former Ruston, Providence, or Savannah soil layers. The soil material now exposed consists chiefly of sand or light sandy clay, although some remnants of the original soil profiles remain. The type has slopes of 5 to 30 percent. It is in small areas chiefly in the Ruston-Providence-Savannah soil association.

Practically all of this land is abandoned and much of it is devoid of any vegetation other than second-growth forests, which are becoming established on some of the older abandoned areas. A few areas have been reforested through the efforts of public agencies. The present vegetation is not generally effective in checking erosion, except in some of the older abandoned areas. The adjacent uplands are being encroached upon by the headward cutting of gullies, and nearby colluvial and bottom lands are damaged by the overwash of the sandy material removed. This land type is more easily reforested than Rough gullied land (Cuthbert soil material), but it requires considerable advance preparation before forests can be established.

Ruston fine sandy loam, hilly phase.—This well-drained soil developed on 15- to 25-percent slopes from Coastal Plain sand and clay and is characterized throughout by a sandy texture. It is the most extensive soil in the Ruston-Providence-Savannah soil association and is also on some of the higher ridges in the Safford-Cuthbert-Ruston soil association. The native vegetation was a deciduous forest of red and white oaks, yellow-poplar, and chestnut.

The soil is strongly to very strongly acid and moderate to low in organic matter, plant nutrients, and water-holding capacity. It is readily permeable to air, roots, and water. Both external and internal drainage are rapid. A few ferruginous sandstone fragments are on the surface and throughout the profile.

Following is a profile description:

- 0 to 14 inches, yellowish-gray to grayish-yellow loose fine sandy loam to loamy fine sand; 12 to 16 inches thick.
- 14 to 26 inches, reddish-brown or brownish-red very friable fine sandy clay loam; 10 to 14 inches thick.
- 26 inches +, brownish-red very friable light sandy clay loam lightly splotched or streaked with gray and yellow, grading into stratified layers of red and gray sand at a depth of about 60 inches; 2 to 15 feet thick.

Present use and management.—Practically all of Ruston fine sandy loam, hilly phase, is still in forest. The woodland has been cut over many times, making the small present stand include many cull trees. Tree growth is comparatively rapid.

Use and management requirements.—The hilly phase of Ruston fine sandy loam is moderately productive of most of the common field crops, but because of its extreme susceptibility to erosion it is not suitable for either crops or pasture. Erosion is difficult to control because of the steep slopes and easily eroded sandy soil material. The soil is probably best used for forests. If used for pasture, it should be sodded soon after the forest cover is removed. A heavy sod-forming pasture mixture is needed, inasmuch as lespedeza and the other plants commonly used will not control erosion. Lime and phosphate are needed to establish the sod. Carefully controlled grazing is necessary to keep a good sod at all times and to prevent further erosion.

Ruston fine sandy loam, eroded hilly phase.—This well-drained sandy upland soil has developed on 15- to 25-percent slopes from sandy Coastal Plain material. Areas are chiefly in the Ruston-Providence-Savannah soil association, with some on the higher ridges in the Safford-Cuthbert-Ruston soil association. The native vegetation was deciduous forest.

Most of the original surface soil has been removed by erosion. Exposure of the red subsoil makes the many small severely eroded spots conspicuous. The present plow layer consists largely of the original surface layer, but there has been some mixing with the subsoil in places. An occasional shallow gully is not uncommon.

The soil is very strongly acid and moderate to low in organic matter, plant nutrients, and water-holding capacity. It is readily permeable to air, roots, and water. Both external and internal drainage are rapid. In many places a few ferruginous sandstone fragments are on the surface and throughout the profile.

Following is a profile description:

- 0 to 8 inches, grayish-yellow loose very friable fine sandy loam; 0 to 10 inches thick.
- 8 to 20 inches, reddish-brown or brownish-red very friable fine sandy clay loam; 10 to 14 inches thick.
- 20 inches +, brownish-red very friable light sandy clay loam lightly splotched with gray and yellow and grading into stratified layers of red and gray sands; 2 to 15 feet thick.

Present use and management.—All of Ruston fine sandy loam, eroded hilly phase, has been cleared and used for crops, although it is now largely in idle land or unimproved pasture. Cotton and cowpeas are the principal crops (pl. 6, A); corn and lespedeza are grown to a limited extent. The soil is moderately productive when first cleared. The common practice is to plant it in row crops, as corn and cotton, until the yields become low, and then to allow it to remain idle. The wild growth on the idle land is not sufficient to check erosion; consequently, the soil becomes severely eroded in an extremely short time. Even when sown to a close-growing crop, as lespedeza, serious loss by erosion is not prevented.

Use and management requirements.—The eroded hilly phase of Ruston fine sandy loam is not suitable for crops or pasture. It is highly susceptible to erosion, and the maintenance of a cover that will

reduce erosion, particularly gullying, is exceptionally difficult. Forestry is the best use for the soil. The problem of reforestation is not so difficult as on Cuthbert or Dulac soils. Shortleaf and loblolly pines do well and usually stabilize erosion within a few years, if gullying is prevented by mechanical means. Black locusts also do well on the fill material behind check dams.

Ruston fine sandy loam, steep phase.—This steep sandy well-drained upland soil on slopes of 25 to 60 percent developed from sandy Coastal Plain material. It is confined largely to the Ruston-Providence-Savannah soil association. The forest cover is deciduous.

The soil is strongly to very strongly acid and moderately low in organic matter, plant nutrients, and water-holding capacity. It is readily permeable to air, roots, and water. Both external and internal drainage are very rapid or rapid. Small sandstone fragments are on the surface and throughout the profile.

This phase is variable in degree of profile development. The various layers are not so distinct as those of the hilly phase and are almost unrecognizable in many places. Following is a representative profile description:

- 0 to 14 inches, yellowish-gray to grayish-yellow loose fine sandy loam to loamy fine sand; 10 to 18 inches thick.
- 14 to 24 inches, reddish-brown or brownish-red very friable fine sandy clay loam; 8 to 16 inches thick.
- 24 inches +, brownish-red very friable light sandy clay loam lightly splotched and streaked with gray and yellow, grading into stratified layers of red and gray sand at a depth of 4 or 5 feet; 2 to 15 feet thick.

Present use and management.—Practically all of Ruston fine sandy loam, steep phase, is in forest of chestnut, yellow-poplar, and red and white oaks. Most of the chestnut stand, however, has been killed by blight. The areas have been cut over several times, and the present stand is small and includes many cull trees. Tree growth is fairly rapid, but fire and grazing lower timber production considerably.

Use and management requirements.—Owing chiefly to steepness and extreme susceptibility to erosion, the steep phase of Ruston fine sandy loam is not suitable for crops or pasture but is apparently best used for forest. Good management practices will be concerned with improving the quality and the production of timber.

Ruston sandy clay loam, severely eroded hilly phase.—This severely eroded well-drained upland soil, developed on 15- to 25-percent slopes from sandy Coastal Plain material, is confined largely to the Ruston-Providence-Savannah soil association, though some areas are in the Safford-Cuthbert-Ruston association.

In most places nearly all the original surface soil has been lost. Gullies are numerous; some are shallow and can be crossed with heavy farm machinery, but many that are deep V-shaped are uncrossable. Although gully erosion has been severe, the intergully areas retain a large part of the original surface soil. The present surface soil is often heavier in texture because of mixing with the subsoil in the plow layer.

The soil is very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. It is readily permeable to air,

roots, and water. Both internal and external drainage are rapid. A few small sandstone fragments are on the surface and throughout the profile.

Following is a profile description :

0 to 4 inches, grayish-yellow to reddish-brown very friable fine sandy clay loam or fine sandy loam; 0 to 8 inches thick.

4 to 16 inches, reddish-brown or brownish-red very friable fine sandy clay loam; 10 to 14 inches thick.

16 inches +, brownish-red very friable light sandy clay loam lightly spotted with gray and yellow; 2 to 15 feet thick.

Present use and management.—All of Ruston sandy clay loam, severely eroded hilly phase, has been cleared and used for crops or pasture, although practically all of it is now idle. Most of the soil was abandoned before it was severely eroded, and the wild growth was not adequate to check erosion. Some areas are beginning to reforest naturally, chiefly with sassafras, persimmon, post and blackjack oaks, and some yellow-poplar.

Use and management requirements.—The severely eroded hilly phase of Ruston sandy clay loam is considered unsuitable for crops or pasture. It has been severely injured by erosion, and the productivity has been lowered by loss of organic matter and plant nutrients and by a reduction in the water-holding capacity. Forestry is probably its best use. The management program is concerned chiefly with stabilizing erosion. Under present conditions this can probably be most quickly and economically accomplished by reforestation, which requires certain preliminary preparations, as building check dams in gullies, contour furrowing, mulching, and fertilizing. Loblolly and shortleaf pines grow well on this soil, and black locusts grow fairly well on fill material.

Safford clay loam, eroded hilly phase.—This heavy-textured well-drained soil of the uplands developed in small areas on ridge slopes of 12- to 25-percent from sandy clay high in content of mica and green sand. The native vegetation was deciduous forest consisting of a high proportion of beech and white oak. The soil is confined largely to the Safford-Cuthbert-Ruston soil association.

Much of the original surface layer has been lost by erosion, and in the plow layer varying quantities of the subsoil have been mixed with remnants of the surface soil. The present surface layer is considerably heavier in texture because of this mixing. Small severely eroded spots are common and conspicuous because of the exposed reddish-brown subsoil. The occasional shallow gullies can usually be obliterated by tillage operations.

The soil is very strongly acid, low in organic matter, and comparatively moderate in content of plant nutrients. External drainage is rapid to very rapid and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water. The surface layer contains numerous small sandstone fragments.

Following is a profile description :

0 to 4 inches, grayish-yellow to light reddish-brown slightly plastic clay loam; 0 to 6 inches thick.

4 to 22 inches, reddish-brown plastic clay or silty clay; 14 to 20 inches thick.

22 inches +, reddish-brown strongly plastic clay spotted with greenish-gray grading into mottled red, brown, yellow, and greenish-gray sandy clay; 2 to 5 feet thick.

Present use and management.—All of Safford clay loam, eroded hilly phase, has been cleared and used for crops. Most of it is now lying idle, although a considerable acreage is used for pasture. The pastures are largely unimproved and unproductive. The recently cleared soil is planted to corn or cotton, with an occasional crop of lespedeza, until the yields became very low; it is then used as unimproved pasture or allowed to remain idle. Crop yields are variable, depending on the severity of erosion and the length of time the soil has been cultivated.

Use and management requirements.—The eroded hilly phase of Safford clay loam is considered unsuitable for crops but suitable for pasture. It has been injured by erosion—tilth properties impaired, fertility lowered, and the moisture supply for the growing crop decreased. The soil has a tendency to bake or crust during dry weather. This results in less absorption of rainfall, greater runoff, and consequently, more injury to crops from drought. Since erosion has increased the susceptibility of the soil to further erosion, a good sod-forming pasture mixture is needed.

Lime and probably phosphate are necessary to establish and maintain a good pasture and a thick sod. Contour furrows probably aid in slowing runoff, increase absorption, and assist in holding available an increased water supply for pasture plants. Diversion ditches can be successfully used to lessen the quantity of water running over the surface, thus reducing soil losses from erosion.

Safford clay loam, severely eroded hilly phase.—This severely eroded well-drained soil of the uplands is characterized by reddish-brown heavy-textured clay subsoil. It has developed on 12- to 25-percent slopes from sandy clay high in mica and green sand. The native vegetation was deciduous forest, chiefly beech and white oak. The soil is in small areas on ridge slopes and is confined largely to the Safford-Cuthbert-Ruston soil association.

This soil is severely eroded—most of the original surface soil and in places part of the subsoil have been lost. Small shallow gullies are common—some uncrossable with heavy farm machinery. A very small part of the light-textured original surface layer remains on the intergully areas.

The soil is very strongly acid, low in organic matter and water-holding capacity, and relatively moderate in plant nutrients. External drainage is very rapid and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water. The plow layer contains numerous small sandstone fragments.

Following is a profile description:

- 0 to 2 inches, grayish-yellow to reddish-brown moderately plastic clay loam; 0 to 5 inches thick.
- 2 to 20 inches, reddish-brown strongly plastic clay or silty clay; 14 to 20 inches thick.
- 20 inches +, reddish-brown strongly plastic clay splotched with greenish-gray grading into mottled red, brown, yellow, and greenish-gray sandy clay; 2 to 5 feet thick.

Present use and management.—All of the severely eroded hilly phase of Safford clay loam has been cleared and used for crops or pasture, but it is now practically all in wasteland except for a small part

in unimproved pasture. Pasture yields are very low, and the vegetative cover is not controlling erosion in many places.

Use and management requirements.—In its present eroded condition, Safford clay loam, severely eroded hilly phase, is unsuitable for crops or for pasture. It can probably be best used and managed for forest. Reforestation is difficult, however, because of the low moisture supply available for young trees. The heavy clay subsoil absorbs water slowly, and most of the rainfall is lost in runoff. Contour furrows, check dams, and mulching are probably necessary to slow runoff and increase absorption. The young trees apparently grow at a rapid rate where the supply of moisture is adequate.

Safford clay loam, eroded rolling phase.—This is a moderately eroded well-drained soil of the uplands, chiefly on ridge crests. Slopes range from 5 to 12 percent. The parent material is sandy clay, with which considerable quantities of mica and green sand and in some places a small quantity of loess are mixed. This soil is in small areas in the Safford-Cuthbert-Ruston soil association. The native vegetation was deciduous forest.

Much of the original surface soil has been lost through erosion. The present surface soil consists of a mixture of remnants of the original surface layer and the upper part of the subsoil. The surface texture is very fine sandy loam in some places, but its mixing with the subsoil has resulted in a clay loam over most areas. Small severely eroded spots are common and conspicuous owing to exposure of the subsoil.

The soil is very strongly acid throughout the profile. It is low in organic matter and water-holding capacity and moderate in content of plant nutrients. External drainage is moderate and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water. The plow layer contains numerous small ferruginous sandstone fragments.

Following is a profile description:

- 0 to 6 inches, grayish-yellow to light reddish-brown slightly plastic clay loam; 0 to 8 inches thick.
- 6 to 28 inches, reddish-brown strongly plastic clay or silty clay; 18 to 24 inches thick.
- 28 inches +, reddish-brown strongly plastic clay, grading into sandy clay highly mottled with red, brown, yellow, and greenish gray; 2 to 5 feet thick.

A few small severely eroded areas are included; they differ in use and management requirements, though their small acreage makes them relatively insignificant.

Present use and management.—All the eroded rolling phase of Safford clay loam has been cleared and used for crops or pasture. The important crops are corn, cotton, cowpeas, and lespedeza. An estimated 40 percent of the area is idle or in unimproved pasture. Fertilizer is not commonly applied; the particular needs of the farm usually determine the crop to be grown. Engineering devices for runoff control are used on few farms. Crop yields vary rather widely on this soil, depending largely on the quantity and distribution of rainfall. Under ordinary management 18 bushels of corn, 200 pounds of cotton, and 0.9 ton of lespedeza hay are average acre yields.

Use and management requirements.—The eroded rolling phase of Safford clay loam is suited to most of the common field crops, but the management requirements necessary to maintain productivity are exacting. Compared with other upland soils of the county, it is moderately productive of most crops. The soil has poor tilth and can be cultivated over only a narrow range of moisture conditions. The heavy-textured subsoil restricts water absorption and thus causes a high rate of runoff. This combination of unfavorable factors probably accounts for the extreme erodibility of the soil. Management practices are concerned primarily with improving tilth and fertility and protecting the soil from erosion. Control of rainfall on the soil is necessary not only to prevent erosion but also to increase production by making more of the water available for the growing plants.

Rotation should be long and include close-growing crops, especially grasses and legumes, as much of the time as is feasible. Deep-rooted crops, as alfalfa, sericea lespedeza, and sweetclover, should be grown to improve the tilth and also the permeability of the subsoil. The soil is apparently moderately well supplied with most plant nutrients, but some fertilization, including liming, is needed. Lime is required for the deep-rooted legumes, phosphate for most crops, and nitrogen for all except the legume and the crop immediately following. The row crop should be followed with a legume cover crop. All cultivation should be as nearly as possible on the contour. The soil is usually in small areas on ridge crests; terraces for erosion control are not practical.

Safford very fine sandy loam, hilly phase.—This well-drained heavy-textured soil of the uplands formed from Coastal Plain sandy clay high in content of mica and green sand. It is characterized by a thin surface soil and a heavy reddish-brown clay subsoil. The soil is in relatively large areas on ridge slopes of 12 to 25 percent throughout the Safford-Cuthbert-Ruston soil association. It is associated chiefly with Dulac, Cuthbert, Ruston, Eupora, and Hymon soils. The forest cover is predominantly beech and white oak but includes other oaks and hickory.

The soil is very strongly acid throughout the profile. It contains a moderate quantity of organic matter and, compared with other upland soils, is moderately high in plant nutrients. External drainage is rapid and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water. It is free of gravel, but numerous small ferruginous sandstone fragments are in the surface layer.

Following is a profile description:

- 0 to 6 inches, yellowish-gray to grayish-yellow loose very fine sandy loam to silt loam; 5 to 8 inches thick.
- 6 to 24 inches, reddish-brown strongly plastic clay or silty clay with an extremely well developed fine angular nutlike structure; 14 to 20 inches thick.
- 24 inches +, reddish-brown strongly plastic clay splotched with greenish-gray, grading into highly mottled red, brown, yellow, and greenish-gray sandy clay; 2 to 5 feet thick.

Present use and management.—All of the hilly phase of Safford very fine sandy loam is in woodland, chiefly beech and white oak. The

present stand is small and is usually of excellent quality. Timber probably grows more rapidly on this soil than on any other soil of the uplands.

Use and management requirements.—Safford very fine sandy loam, hilly phase, is unsuitable for crops. It is better suited to pasture, but forestry is probably the best use. The cleared soil is highly susceptible to erosion and is subject to severe damage. Owing to the tough plastic subsoil, internal drainage is slow and runoff is correspondingly great. Runoff is difficult to control and consequently the soil erodes rapidly. Before the thin surface soil has been thus completely lost, recently cleared areas should be seeded with a sod-forming pasture mixture. To maintain a good pasture requires applications of lime and probably phosphate. Grazing should be carefully controlled so as to maintain a good sod at all times.

Safford very fine sandy loam, steep phase.—This heavy-textured well-drained soil on steep upland slopes (25 to 50 percent) has developed from unconsolidated sandy clay that contains mica and green sand. It differs from the hilly phase chiefly in having steeper slopes. The soil is in relatively large areas on ridge slopes in the Safford-Cuthbert-Ruston soil association. The native vegetation consisted mainly of white oak and beech forest.

The soil is very strongly acid, contains a moderate quantity of organic matter, and is moderately high in plant nutrients. External drainage is very rapid and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water and relatively free of gravel, although numerous small sandstone fragments are in the surface layer in many places.

Following is a profile description:

- 0 to 6 inches, yellowish-gray to grayish-yellow loose very fine sandy loam to silt loam; 4 to 10 inches thick.
- 6 to 20 inches, reddish-brown strongly plastic clay or silty clay; 10 to 20 inches thick.
- 20 inches +, reddish-brown strongly plastic clay splotted with greenish-gray, grading into highly mottled red, brown, yellow, and greenish-gray sandy clay; 2 to 5 feet thick.

Present use and management.—Practically all of the steep phase of Safford very fine sandy loam is in forest. Beech and white oak are the dominant trees, but other oaks and hickory are common. In most places the forests have been cut over recently. The trees in the present stand are small, their growth is rapid, and their timber quality excellent.

Use and management requirements.—The steep phase of Safford very fine sandy loam is not suitable for field crops, and owing to steepness and extreme susceptibility to erosion it is very poorly suited to pasture. Under present conditions the soil is best suited physically to forest. Good management is concerned chiefly with improving the quality and quantity of timber.

Safford very fine sandy loam, rolling phase.—This well-drained heavy-textured soil of the uplands developed on 5- to 12-percent slopes from sandy clay high in content of mica and green sand. It is characterized by a thin surface soil and a heavy reddish-brown clay subsoil. In many places the parent material includes a small quantity of loess. The soil is on ridge crests in the Safford-Cuthbert-Ruston

soil association. It is associated with Dulac, Cuthbert, Ruston, and other Safford soils. The forest cover is predominantly white oak and beech.

This soil is very strongly acid, contains a moderate quantity of organic matter, and is moderately high in plant nutrients but moderately low in water-holding capacity. External drainage is moderate and internal drainage moderately slow. The soil is moderately to slightly permeable to air, roots, and water. Numerous small ferruginous sandstone fragments are in the surface layer.

Following is a profile description:

0 to 8 inches, yellowish-gray to grayish-yellow loose to friable very fine sandy loam or silt loam; 6 to 10 inches thick.

8 to 30 inches, reddish-brown strongly plastic clay or silty clay; 18 to 24 inches thick.

30 inches +, reddish-brown strongly plastic clay grading into sandy clay highly mottled with red, brown, yellow, and greenish-gray; 2 to 5 feet thick.

Present use and management.—All the rolling phase of Safford very fine sandy loam is in forest, chiefly white oak and beech. In most places the forest has been cut over recently, and the present stand is small and includes many cull trees. The timber grows moderately rapidly but is of a quality noticeably poorer than that on the hilly phase.

Use and management requirements.—Safford very fine sandy loam, rolling phase, is physically suited to most of the crops common to the area, and compared with other soils of the upland it is moderately productive. Most of this soil, however, is on narrow winding ridge crests in association with hilly and steep Safford soils; consequently, it is economically unfeasible to cultivate.

Many areas are best used for pasture; the more isolated ones are best for forest. Good pasture can be obtained by using lime and phosphate. Potash is apparently not necessary for any of the common pasture plants or field crops. The pasture mixture should include legumes, as the soil is moderately low in nitrogen. The soil is highly susceptible to erosion, and the management of areas to be used for crops should be concerned with runoff and erosion control. Management of the cleared areas is similar to that of Safford clay loam, eroded rolling phase.

Savannah very fine sandy loam, rolling phase.—This moderately well-drained hardpan soil of the uplands is characterized by a sandy surface layer. It developed on 5- to 15-percent slopes from sandy Coastal Plain material that apparently contains a mixture of loess. It is similar in appearance to the Providence soils but differs chiefly in being sandy throughout the profile. This soil is on narrow ridge crests in the Ruston-Providence-Savannah soil association and on ridge slopes in the Dulac-Savannah-Briensburg association. The native vegetation was deciduous forest.

This soil is low in organic matter, plant nutrients, and water-holding capacity, and is strongly to very strongly acid. External drainage is moderate and internal drainage moderately slow. The surface and subsoil layers are permeable to air, water, and roots, but the hardpan is only slightly permeable. The soil is relatively free of gravel or stones.

Following is a profile description:

- 0 to 8 inches, yellowish-gray to grayish-yellow very friable fine sandy loam to loam; 6 to 10 inches thick.
- 8 to 28 inches, yellowish-brown to brownish-yellow friable clay loam to light silty clay loam; 16 to 24 inches thick.
- 28 to 40 inches, compact fine sandy clay loam to clay loam mottled with gray, yellow, and brown; 8 to 16 inches.
- 40 inches +, yellowish-brown or reddish-brown fine sandy clay loam splotted and streaked with gray and yellow; 1 to 4 feet thick.

Some small areas of Savannah soils are included that have 2- to 5-percent slopes, and a few sandier areas that do not have a hardpan. These inclusions differ somewhat in use and management requirements but are relatively unimportant because of the small acreage.

Present use and management.—All of Savannah very fine sandy loam, rolling phase, is in deciduous forest, chiefly of white, red, black-jack, and post oaks and pignut hickory. Most of the areas have been cut over a number of times, and the present stand is small and includes many cull trees. Tree growth is moderately slow.

Use and management requirements.—The rolling phase of Savannah very fine sandy loam is physically suitable for crops and for pasture. Although much of the soil is adjacent to existing fields or in areas large enough to be economically cultivated, a considerable acreage is in long narrow areas associated with steep Ruston soils not suited to crops or pasture. The soil has good tilth, a moderate slope, and is free of stones or gravel; consequently, it is easy to cultivate. On the other hand, it is low in organic matter, lime, phosphorus, potash, and probably most other plant nutrients. In addition, it is characterized by a hardpan that restricts internal drainage and root penetration. Chiefly because of the low fertility and low water-holding capacity, the soil is relatively low in productivity and somewhat limited in crop adaptation. It is fairly well suited to most of the crops common to the county, but fertilizer is needed for good yields. Management practices are similar to those for the eroded rolling phase.

Savannah very fine sandy loam, eroded rolling phase.—This is a moderately well-drained hardpan soil of the uplands characterized by a sandy surface soil. It has developed on 5- to 15-percent slopes from sandy Coastal Plain material that apparently contains a mixture of loess. The native vegetation was deciduous forest. The soil is on ridge crests in the Ruston-Providence-Savannah soil association and on ridge slopes in the Dulac-Savannah-Briensburg soil association.

Much of the original surface soil has been lost through erosion, and in the plow layer the present surface soil has been mixed with the subsoil. This layer, therefore, is heavier in texture in some places than in others, and exposure of the subsoil makes small severely eroded spots common and conspicuous. Most of the few shallow gullies can be obliterated in tillage.

The soil is low in organic matter, plant nutrients, and water-holding capacity, and strongly to very strongly acid. External drainage is moderate and internal drainage moderately slow. The surface soil and subsoil layers are permeable; the hardpan only slightly so. The soil is relatively free of gravel or stone.

Following is a profile description :

- 0 to 6 inches, grayish-yellow to light yellowish-brown friable very fine sandy loam or clay loam ; 0 to 8 inches thick.
- 6 to 26 inches, yellowish-brown to brownish-yellow friable clay loam to light silty clay loam ; 16 to 24 inches thick.
- 26 to 38 inches, compact fine sandy clay loam to clay loam mottled with gray, yellow, and brown ; 8 to 16 inches thick.
- 38 inches +, yellowish-brown or reddish-brown fine sandy loam spotted and streaked with gray and yellow ; 1 to 4 feet thick.

Included are small areas of other Savannah soils that differ chiefly in having 2- to 5-percent slopes and also some sandier areas that do not have a hardpan. These inclusions differ in use and management, but their small acreage makes them relatively unimportant.

Present use and management.—All of the eroded rolling phase of Savannah very fine sandy loam has been cleared, and most of it is in crops or pasture. About 15 percent is used for corn, 10 percent for cotton, 15 percent for hay, 10 percent for pasture, 10 percent for miscellaneous crops, and 40 percent is idle or in wasteland. Systematic crop rotation is not practiced, and fertilizer is used only for the cash crop cotton, which generally receives an inadequate quantity of low-analysis fertilizer. Under common management practices, 16 bushels an acre of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay can be expected.

Use and management requirements.—Savannah very fine sandy loam, eroded rolling phase, is physically only fairly well suited to the common field crops. Owing to low fertility and low water-holding capacity, it is low in natural productivity. The soil is responsive to good management but difficult to maintain at a high level of production. A moderately long crop rotation, including legumes and grasses, and proper and adequate fertilization would maintain the productivity level.

Lime and phosphate are essential for best results with legumes, especially the deep-rooted ones, and cover crops should be similarly treated for better protection of the soil. Phosphate is needed for all crops, and nitrogen for all except the legume and the crop immediately following. Potash is needed for many crops, especially cotton and the deep-rooted legumes. The supply of organic matter is generally very low and should be increased and maintained at a higher level. Growing grasses, green manuring, and applying barnyard manure increase the supply of organic matter and should result in substantial increases in crop yields.

In addition to crop rotation and fertilization it may be necessary to use special measures for runoff and erosion control. Contour farming or, if the slopes are long, contour strip cropping will aid in preventing further erosion. Terraces may be necessary to prevent excessive runoff and probably would be effective, since the hardpan under this soil is more permeable than that under the Dulac soils.

Savannah clay loam, severely eroded rolling phase.—This severely eroded moderately well-drained soil of the uplands developed on 5- to 15-percent slopes under a deciduous forest vegetation and is characterized by a sandy texture and a hardpan at about 2 feet. The parent material consists of sandy Coastal Plain material with probably a small mixture of loess. It is on ridge slopes in the Ruston-

Providence-Savannah and Dulac-Savannah-Briensburg soil associations.

This soil is severely eroded; most of the original surface soil and part of the subsoil have been lost. Shallow gullies are common, and in most places patches of the original surface soil remain on the intergully areas. A few gullies have cut through the hardpan and exposed the reddish-brown underlying material. Most of the present plow layer consists of subsoil material.

The soil is low in organic matter and plant nutrients, strongly to very strongly acid, and low or very low in water-holding capacity. External drainage is moderate to rapid and internal drainage moderately slow. The surface and subsoil layers are permeable to air, roots, and water; the hardpan only slightly so. The soil is relatively free of stones or gravel.

Following is a profile description :

- 0 to 4 inches, grayish-yellow to light yellowish-brown friable clay loam ; 0 to 6 inches thick.
- 4 to 24 inches, yellowish-brown to brownish-yellow friable clay loam to light silty clay loam ; 16 to 24 inches thick.
- 24 to 36 inches, compact fine sandy clay loam to clay loam mottled with gray, yellow, and brown ; 8 to 16 inches thick.
- 36 inches +, yellowish-brown or reddish-brown fine sandy clay loam splotched and streaked with gray and yellow ; 1 to 4 feet thick.

Present use and management.—All of the severely eroded rolling phase of Savannah clay loam is cleared and has been used for crops and pasture, although most of it is now idle or in wasteland. A small acreage is in unimproved pasture, but very little is in crops. Crop and pasture yields are extremely low. The severely eroded condition indicates former improper uses and poor management.

Use and management requirements.—Savannah clay loam, severely eroded rolling phase, has been so severely injured by erosion that it is now unsuitable for crops and can probably be used and managed to best advantage for pasture. It is poorly suited to this use, however, and lime, phosphate, and possibly potash are necessary to establish and maintain good pastures. The pasture mixture should include legumes, and nitrogen fertilizers will be needed to establish the sod. Terraces may be necessary to control runoff and erosion until the sod is well established.

If this soil is used for crops, the rotation should be long and should include many close-growing crops, as grasses and legumes, preferably deep-rooted legumes. These crops are difficult to establish, but sericea lespedeza and sweetclover can be established and maintained if the soil is treated with lime and phosphate. Fertilizer is needed for all crops. Cultivation should be on the contour, with strip cropping on the long slopes. Terraces are probably needed to slow runoff and thus aid in erosion control.

Sequatchie fine sandy loam.—This well-drained sandy soil of the low Tennessee River terraces is flooded at infrequent intervals. The alluvium from which it has formed has washed from soils of the uplands underlain by a wide variety of rock, including sandstone, and by unconsolidated Coastal Plain sands. It is on nearly level to gently sloping areas having slopes of 1 to 5 percent. The soil is in the Huntington-Egam-Wolftever soil association and is closely associated

with Wolftever, Bruno, Lindsides, Huntington, and Egam soils. The forest vegetation is deciduous. A total of 1,159 acres has been inundated by the Kentucky Reservoir since mapping.

The soil is strongly acid and comparatively high in content of organic matter and plant nutrients. It is very permeable to air, roots, and water, moderately high in water-holding capacity, and relatively free of gravel or stones, although there are some large cobbles in places.

Following is a profile description :

0 to 10 inches, grayish-brown to brown very friable fine sandy loam ; 8 to 12 inches thick.

10 to 30 inches, brown to yellowish-brown friable light clay loam ; 18 to 24 inches thick.

30 inches +, yellowish-brown to brownish-yellow clay loam spotted with gray and yellow ; 2 to 5 feet thick.

A small acreage in the vicinity of Danville Ferry is considerably sandier than the normal phase; it has a loamy fine sand surface soil. Most of the soil is uneroded, but some included areas have lost much of the surface soil through erosion. Most of these areas are indicated on the soil map by erosion symbol.

Present use and management.—Practically all of Sequatchie fine sandy loam has been cleared and used for crops. About 30 percent is in corn, 25 percent in cotton, 20 percent in hay, and 15 percent in miscellaneous crops, and 10 percent is lying idle. A wide variety of crops is grown, but they are not systematically rotated. On most farms row crops are planted for 4 or 5 years and then lespedeza for 2 years. On many farms cotton is grown almost continuously, and until recently it was the only crop fertilized. Some lime and phosphate are now being used on the legume crop. The fertilization for cotton consists of about 200 pounds of superphosphate or a 4-10-4 or similar mixture. Under ordinary management practices 30 bushels of corn, 360 pounds of cotton, and 1.2 tons of lespedeza hay are average acre yields.

Use and management requirements.—Sequatchie fine sandy loam is one of the most desirable soils for crops. It has a gently sloping surface, excellent tilth, moderately high content of plant nutrients, and high water-holding capacity. Under good management it is well suited to a wide variety of crops, including red clover and alfalfa. Though relatively high in natural productivity, it still responds well to good management. Much higher yields can be obtained by crop rotation and fertilization.

Rotations can be moderately short but they should include a legume crop. Deep-rooted legumes, as alfalfa, can be grown successfully if properly limed and fertilized. Red clover is grown in many places without fertilizer, although lime and phosphate are required for best results. The application of lime and phosphate and the incorporation of organic matter are of primary importance in any improved management program for this soil. Under good management 45 bushels of corn, 520 pounds of cotton, and 2.4 tons of red clover hay are average acre yields.

Shannon silt loam.—This young well-drained brown soil is without a textural profile. The recent alluvium from which it formed consists of a mixture of materials washed from soils of the uplands

underlain by loess or Coastal Plain material, the loessal material apparently predominating. The soil is on low nearly level first bottom land and is generally flooded one or more times a year. The small areas are along some of the streams draining the loessal plain and the sandy Coastal Plain sections. Hymon, Beechy, Alva, and Briensburg soils are closely associated with this soil. The native vegetation was deciduous forest. A total of 300 acres has been covered by the Kentucky Reservoir since the time of mapping.

This soil is strongly to very strongly acid and comparatively high in organic matter and plant nutrients. It is very permeable to air, roots, and water. External drainage is slow or very slow and internal drainage moderate. The water-holding capacity is high. The soil is relatively free of gravel, and the lower layers are sandy.

Following is a representative profile description :

0 to 12 inches, grayish-brown to brown mellow silt loam ; 8 to 16 inches thick.

12 to 30 inches, light-brown friable silt loam ; 8 to 20 inches thick.

30 inches +, brownish-gray friable silt loam or fine sandy loam spotted with gray ; 1 to 5 feet thick.

Present use and management.—About 85 percent of Shannon silt loam is cleared and used for crops, with about 75 percent of the cleared land in corn, 10 percent in cotton, and 15 percent in miscellaneous crops, as lespedeza, cowpeas, and soybeans. The uncleared areas are covered with a good stand of deciduous trees, largely beech, oak, and hickory. Corn is grown almost continuously, and only an occasional cotton or hay crop is produced. Fertilizer is rarely used, even for the cotton crop. Under usual management practices 35 bushels of corn, 280 pounds of cotton, and 1.4 tons of lespedeza hay are average acre yields.

Use and management requirements.—Shannon silt loam is easily worked, easily conserved, and relatively productive of the crops to which suited. Owing to susceptibility to flooding the use suitability is somewhat limited. It is well suited to corn, annual hay crops, and many other forage crops. Some areas are suited to cotton, although the vegetative growth is too vigorous in most places. It is not well suited to small grains, because of susceptibility to lodging and to flooding in winter and early spring.

The relatively high productivity of this soil can be increased materially by proper management. Many of the areas that have been continuously in corn need nitrogen and possibly phosphate for continued high yields. The nitrogen can be supplied by the use of fertilizer or by turning under legumes. Lime and phosphate can be used profitably on the legume crops; potash is needed in most places for cotton. The periodic flooding of the soil aids in replenishing the organic-matter and plant-nutrient supply by depositing additional sediment. The average yields are reduced by the loss of an occasional crop by flooding. Under good management 50 bushels of corn, 480 pounds of cotton, and 1.6 tons of lespedeza hay are average acre yields.

Shannon fine sandy loam.—This brown well-drained sandy soil of the low nearly level first bottoms is subject to flooding by the streams along which it occurs. Part of it (175 acres) has been covered by the Kentucky Reservoir. This soil has formed from mixed alluvium

washed from soils of the uplands underlain by loessal and Coastal Plain material, the sandy Coastal Plain material apparently predominating. The soil is largely along the streams draining the Ruston-Providence-Savannah association and in the Freeland-Briensburg-Hymon association. The Hymon, Beechy, and Alva are closely associated. The native vegetation consisted of deciduous forest.

The soil is strongly to very strongly acid and moderate in content of organic matter and plant nutrients. It is extremely permeable to air, roots, and water. External drainage is slow and internal drainage moderate to rapid. The water-holding capacity is moderate to high.

Following is a profile description :

0 to 10 inches, grayish-brown or brownish-gray loose fine sandy loam ; 8 to 12 inches thick.

10 to 30 inches, light-brown friable fine sandy loam ; 8 to 20 inches thick.

30 inches +, brownish-gray fine sandy loam to loamy fine sand spotted with gray and rust brown ; 1 to 5 feet thick.

Present use and management.—Shannon fine sandy loam is used and managed like Shannon silt loam. Less corn and more cotton and miscellaneous crops are grown on it, however, and crop yields are generally lower. Under the usual management practices 30 bushels of corn, 260 pounds of cotton, and 1.3 tons of lespedeza hay are average acre yields.

Use and management requirements.—Shannon fine sandy loam is less desirable for crops than Shannon silt loam, though probably suited to a somewhat wider variety of crops. Crops are more susceptible to drought, however, and soil fertility is lower and more easily depleted by leaching and crop removal. The soil is medium to low in content of organic matter, nitrogen, lime, phosphate, and potash in most places but responds well to the addition of these elements. The management problem is concerned with adding these elements cheaply and utilizing them efficiently. The management requirements are similar to those of Shannon silt loam.

Shubuta fine sandy loam, rolling phase.—This well-drained soil of the uplands developed on 5- to 12-percent slopes and is characterized by a heavy-textured yellowish-red subsoil. The parent material is residuum from sandy clay that contains thin platy layers of the bluish-gray clay. The soil is chiefly on narrow ridge crests in the Safford-Cuthbert-Ruston soil association. The forest vegetation is deciduous.

The soil is very strongly acid, low in organic matter, plant nutrients, and water-holding capacity, and only slightly permeable to air, roots, and water. External drainage is moderate and internal drainage slow. Small sandstone fragments are common in the surface and throughout the profile, and a few small pebbles occur locally.

Following is a profile description :

0 to 8 inches, grayish-yellow to yellowish-gray loose fine sandy loam ; 6 to 10 inches thick.

8 to 24 inches, yellowish-red to reddish-yellow strongly plastic clay ; 14 to 20 inches thick.

24 to 40 inches, plastic sandy clay highly mottled with red, yellow, and gray ; 10 to 20 inches thick.

40 inches +, reddish-yellow sandy clay with thin platy layers of bluish-gray clay.

This phase has exceptionally variable characteristics. The surface soil varies from fine sandy loam to loamy fine sand, and the color of the subsoil ranges from red to yellow. In some places the small quantity of loess mixed in the surface layer imparts a silty texture. Small areas of Cuthbert and Dulac soils are included with this separation, chiefly because of their small extent, but they do not significantly change the management requirements. On some cleared areas most of the surface soil has been lost through erosion.

Present use and management.—Practically all the rolling phase of Shubuta fine sandy loam is in forest, chiefly post, blackjack, and red oaks and pignut hickory. The trees in the present stand are small, of poor quality, and of very slow growth. The soil will produce very little salable timber.

Use and management requirements.—Although the rolling phase of Shubuta fine sandy loam is physically suited to some field crops, most of it is on narrow winding ridge crests in highly dissected areas. In such positions it is not generally feasible to cultivate the soil and on many farms it is best to leave it in forest. The slowly permeable subsoil inhibits the absorption and percolation of water, retards the movement of moisture, and ultimately develops extreme wet and dry conditions in the surface soil. Consequently, crop injury from both wet and dry periods is severe. Restricted water absorption increases surface runoff, particularly during heavy rainfall, and this probably more than any other factor accounts for the extreme erodibility of the soil.

If this soil must be used for crops, the rotation should be long and should consist largely of close-growing crops. Fertilization also is essential. Lime, phosphate, and probably potash are needed; and nitrogen is needed for all except the legume and the crop immediately following. Green manure and barnyard manure incorporated with the soil tend to improve poor tilth. Cover crops are badly needed after all row crops. Engineering devices for erosion control are not generally applicable.

Taft silt loam.—This is an imperfectly drained soil of terraces, mostly low terraces of the Tennessee River in the Huntington-Egam-Wolftever soil association. Some areas, however, are on low terraces of the streams in the cherty limestone hill section. Wolftever, Robertsville, Paden, Humphreys, Lindside, and Melvin are closely associated soils. The old alluvium from which this soil has formed has washed from soils of the uplands underlain by a wide variety of rock, including limestone. Slopes are nearly level to gently sloping (1 to 3 percent). The native vegetation was deciduous forest with a high proportion of water-tolerant trees. Since mapping, 3,794 acres of this soil has been covered by the Kentucky Reservoir.

The soil is strongly to very strongly acid and low in organic matter, plant nutrients, and water-holding capacity. External drainage is very slow to moderate and internal drainage slow. The surface soil and subsoil are permeable; the siltpan is relatively impermeable. The water table is at or near the surface in rainy seasons, especially during winter and early spring. In general, the soil is free of stones or gravel, but along the streams in the cherty limestone hill section there may be a considerable quantity of water-worn chert throughout the profile.

Following is a profile description :

- 0 to 8 inches, gray to yellowish-gray mellow silt loam ; 6 to 12 inches thick.
- 8 to 22 inches, pale-yellow friable silty clay loam splotted with gray below about 15 inches ; 10 to 16 inches thick.
- 22 to 42 inches, siltpan of very compact silty clay loam highly mottled with gray, yellow, and brown ; 16 to 24 inches thick.
- 42 inches +, yellowish-brown heavy silty clay loam splotted with yellow and gray ; 2 to 10 feet thick.

Profile characteristics vary considerably. On many of the low Tennessee River terraces the surface soil is brownish gray, and the profile throughout is heavier than normal for the type. On the low terraces of small streams considerable gravel may be in the profile and the siltpan is missing or only weakly developed. These variations do not differ significantly in use and management requirements.

Present use and management.—Taft silt loam is used and managed like the adjoining Paden or Wolfcreek soils, except that a larger part is in forest and probably a slightly larger part is idle. The forests consist of sweetgum, blackgum, beech, ash, hickory, and willow oak. Crop failures are more common on this soil than on the adjacent better drained areas, and the average yields are considerably less. The more water-tolerant crops are usually selected for areas large enough to be used as a unit. In such areas corn, lespedeza, soybeans, and sorghum are the principal crops. Under the prevailing system of management corn yields about 15 bushels an acre ; lespedeza hay, 0.7 ton.

Use and management requirements.—The use suitability of Taft silt loam is limited by imperfect drainage. Corn, soybeans, lespedeza, white clover, alsike clover, and redtop are among the suitable crops. Surface drainage can be improved by open ditches in many places, and this would be expected to broaden the use suitability. Tile drains are not ordinarily practical. The soil is physically suited to short rotations, but it can be used in long rotations to good advantage because of the limited variety of crops that can be grown.

The soil is low in lime and in most plant nutrients. Management should supply these elements as cheaply and effectively as possible. Nitrogen can best be supplied by growing a legume in the rotation and by following intertilled crops with a legume cover crop to be turned under. Moderate to heavy applications of lime and phosphate and possibly potash are needed for best results with the legume crop. Phosphate is a requisite for all crops. The need for potash depends on the crop grown and previous treatment of the soil.

Tippah silt loam, eroded rolling phase.—This moderately well-drained siltpan soil of the uplands is characterized by extremely heavy plastic clay beneath the siltpan. The parent material consists of a loess layer about 2 to 3½ feet thick. The soil is in small areas on 5- to 12-percent slopes closely associated with Dulac, Briensburg, Hymon, and Beechy soils. The greater part of the total acreage is in the southern part of the Dulac-Savannah-Briensburg soil association, but areas are also in the Safford-Cuthbert-Ruston soil association. The forest vegetation is deciduous.

Much of the original surface layer has been lost through erosion. The subsoil has been somewhat mixed with the surface soil in the plow layer, but it has not made the present surface soil significantly heavy

except in the more severely eroded areas. Exposure of the subsoil makes small severely eroded spots common and conspicuous.

The soil is strongly to very strongly acid, apparently low in organic matter and plant nutrients, and low or very low in water-holding capacity. The surface and subsoil layers are permeable to air, roots, and water; the siltpan is relatively impermeable.

Following is a profile description:

- 0 to 6 inches, grayish-yellow to light yellowish-brown friable silt loam; 0 to 8 inches thick.
- 6 to 20 inches, yellowish-brown to brownish-yellow friable silty clay loam; 12 to 18 inches thick.
- 20 to 40 inches, siltpan of very compact heavy silty clay loam highly mottled with gray, yellow, and brown; 18 to 24 inches thick.
- 40 inches +, very strongly plastic clay mottled with gray, yellow, and red; 2 to 5 feet thick.

Included are small areas of Tippah soils on 2- to 5-percent slopes; some severely eroded areas on 5- to 12-percent slopes; and a few small uneroded wooded areas, the aggregate total acreage of which is small.

Present use and management.—Part of the eroded rolling phase of Tippah silt loam is still in forest, part in crops, and the largest part is lying idle. The individual areas average only about 2 acres and as they are in fields with Dulac soils they are used and managed similarly. The soil is apparently more erosive than the eroded rolling phase of Dulac silt loam, for it becomes more eroded when under the same management. Under common management practices 16 bushels of corn, 220 pounds of cotton, and 0.7 ton of lespedeza hay are average acre yields.

Use and management requirements.—Tippah silt loam, eroded rolling phase, is inferior to the Dulac and Providence soils for crops or pasture, chiefly because of the relatively impervious siltpan and substratum layers. These greatly decrease the absorptive capacity and thus increase the rate of runoff and subsequent erosion, particularly during heavy rainfall. The soil is also lower in water-holding capacity, and crops are damaged more often by drought, but tilth is favorable, as the soil is on slopes that are easily worked. Internal drainage is retarded by the siltpan but is adequate for most crops commonly grown in the area.

The use and management requirements are similar to those for Dulac silt loam, eroded rolling phase. This soil is more susceptible to erosion, however, and the rotation should be longer and include close-growing crops a greater part of the time. Tillage should be on the contour, and terraces are probably needed, though terracing may not be found practicable. Fertilizer requirements are the same for similar crops, but less response is expected in this soil because of its less favorable water supply.

Wolftever silt loam.—This is a moderately well-drained soil in fairly large areas on low Tennessee River terraces or on tributary streams influenced by backwater from the river. The old mixed alluvium from which the soil has formed has washed from upland soils underlain by a wide variety of rock, including limestone. The soil has developed on 1- to 5-percent slopes and is confined to the Huntington-Egam-Wolftever soil association. The forest vegetation is deciduous. Since mapping, 3,170 acres have been inundated by the Kentucky Reservoir.

The soil is strongly acid and moderately well supplied with organic matter and plant nutrients. The water-holding capacity is moderately low. Drainage, both internal and external, is moderately slow. Owing to the compactness of the subsoil the movement of air and water is somewhat retarded and root penetration is slightly restricted.

Following is a profile description :

0 to 8 inches, brownish-gray to grayish-brown friable silt loam ; 6 to 10 inches thick.

8 to 30 inches, yellowish-brown to brownish-yellow slightly compact to compact heavy silty clay loam ; 15 to 25 inches thick.

30 inches +, brownish-yellow moderately friable silty clay loam splotted with gray and yellow ; 2 to 10 feet thick.

Considerable variation occurs in age and in degree of profile development. The young broad nearly level areas about 4 miles south of Eva are heavier in texture than the normal phase, have a more compact subsoil, and are lower in productivity. Crops are frequently damaged by drought on this variation. On the older terraces—those that are flooded only at long intervals—the surface soil is more highly leached and lighter in color and texture. The subsoil is also lighter in color and texture and more friable ; a weakly developed siltpan has formed in many places. This variation is approaching the Paden soils in age and profile characteristics.

Present use and management.—About 30 to 40 percent of Wolftever silt loam is in forest. On the cleared areas, corn, cotton, and lespedeza are the principal crops. The soil is used like Sequatchie fine sandy loam, but a larger part is idle each year. The crops are not rotated with the idea of maintaining or increasing crop yields. The needs of the farmer largely determine which crop is to be grown. Fertilizer is not commonly used, except on the cotton crop, on which about 200 pounds of superphosphate or a 4-10-4 mixture is the common application. In recent years some lime and phosphate have been used on the lespedeza crop. Under ordinary management 25 bushels of corn, 280 pounds of cotton, and 1 ton of lespedeza hay are average acre yields.

Use and management requirements.—Wolftever silt loam is physically suitable for crops and is moderately high in fertility. The compact subsoil and the lower water-holding capacity, however, make the crop yields moderate, depending on the quantity and distribution of rainfall. The susceptibility to flooding limits the use of the soil to some extent. Winter annuals and perennial or biennial crops are occasionally grown. The infrequent loss of these crops should not prohibit their use.

Since this soil has an unfavorable subsoil and substratum consistence, it may be more difficult to increase the productivity than on the associated Sequatchie soil. Good response can be expected from fertilization and systematic crop rotation. The rotation can be moderately short but should include a legume, preferably a deep-rooted one. Lime and phosphate are needed for best results with the legume crop. Nitrogen is needed for all except the legume and the crop immediately following. The need for potash depends largely on the crop to be grown and previous treatment of the soil ; the cotton crop needs potash in most places. It is important that the supply of organic matter be maintained or increased, and favorable results can

be expected from green manure or from barnyard manure. Growing grasses with fibrous root systems also tends to increase the supply of organic matter and to improve the tilth.

Wolftever silty clay loam, eroded phase.—This eroded moderately well-drained soil of the low terraces developed on 1- to 5-percent slopes from old mixed alluvium. The alluvium has washed from soils of the uplands underlain by a wide variety of rock, including limestone. Areas occur on low Tennessee River terraces or on tributary streams influenced by backwater from the river, and since the time of mapping, 2,110 acres have been inundated by the Kentucky Reservoir. The soil is confined to the Huntington-Egam-Wolftever soil association.

Much of the original surface soil has been lost by erosion, and in many places a small quantity of the subsoil has been mixed with the rest of the surface soil. This mixing of the two in the plow layer has resulted in a heavier textured surface layer. A few small severely eroded areas, conspicuous because of the large quantity of exposed subsoil, are included.

The soil is strongly acid and moderately well supplied with organic matter and plant nutrients. The water-holding capacity is moderately low, and both external and internal drainage are moderately slow. Owing to the compactness of the subsoil, the movement of air and water is retarded and root penetration is restricted.

Following is a profile description:

- 0 to 6 inches, grayish-brown, light-brown, or yellowish-brown friable silty clay loam or silt loam; 0 to 8 inches thick.
- 6 to 28 inches, yellowish-brown to brownish-yellow slightly compact to compact heavy silty clay loam; 15 to 25 inches thick.
- 28 inches +, brownish-yellow moderately friable silty clay loam splotted with gray and yellow; 2 to 10 feet thick.

Present use and management.—All the eroded phase of Wolftever silty clay loam has been cleared and used for crops. About 35 percent is in corn, 20 percent in cotton, 20 percent in lespedeza, and 15 percent in miscellaneous crops, and 10 percent is idle. Crops are not rotated systematically, nor is fertilization for all crops a common practice. Cotton usually receives a light application of a complete fertilizer, and lime and phosphate are used on lespedeza by some farmers. Crop yields are decidedly less on this soil than on the slightly eroded or uneroded phases of the same soil type. Under ordinary management practices 18 bushels of corn, 240 pounds of cotton, and 0.8 ton of lespedeza hay are average acre yields.

Use and management requirements.—Wolftever silty clay loam, eroded phase, has been significantly injured by erosion, which has impaired the tilth properties. The fertility is lower and the moisture supply available for growing plants is considerably less than for the uneroded soil. The soil has a tendency to bake or become hard and crusty on top, and the result is less absorption of rainfall and consequently more injury to crops during droughts. Cultivation under unfavorable moisture conditions should be avoided, as the soil is susceptible to clodding and puddling.

Crop yields can be maintained or increased by improved management practices. These should consist of a systematic crop rotation, including legumes and grasses, and adequate applications of ferti-

lizer. Lime, phosphate, and probably potash are needed to increase crop yields greatly. The nitrogen needed can probably be most economically added by including a legume in the rotation at frequent intervals. A grass crop included in the rotation aids in maintaining or increasing the needed supply of organic matter. Green manure and the application of barnyard manure increases the supply of organic matter. Terraces and other mechanical means of runoff and erosion control are not necessary if other management practices are carried out. Under good management 30 bushels of corn, 400 pounds of cotton, 1.2 tons of lespedeza hay, and 1.1 tons of red clover hay are average acre yields.

USE, MANAGEMENT, AND PRODUCTIVITY OF BENTON COUNTY SOILS

The soils of Benton County are grouped in five land classes on the basis of their relative suitability for farming and in management groups according to their management requirements. Expected yields of crops on the soils under two levels of management are given in the section on Estimated Yields. Although the use, management, and productivity of soils are determined largely by their physical properties, many other factors, such as economic conditions, climate, and interest of the farm operators, are important.

LAND CLASSIFICATION

On the basis of their relative suitability for agriculture, the soils of Benton County are grouped in five classes (First-, Second-, Third-, Fourth-, and Fifth-class soil). Information obtained from farmers, soil surveyors, extension workers, experiment station workers, and others who work with the soil was used in placing the soils in these five land classes. Comparisons were made among the soils, considering productivity, workability, and conservability. For example, a farmer knows that some soils on his farm are better suited to agriculture than others. By such comparisons within farms and among farms the soils can be placed in the approximate order of their physical suitability for agriculture. When information based on experience is lacking, rankings can be arrived at by comparing the soils with those of similar productivity, workability, and conservability for which information is available.

FIRST-CLASS SOILS

First-class soils are productive, easy to work, and easy to conserve. Consequently, they are physically well suited to crops common to the area. They are good to excellent soils for crops that require tillage and for permanent pasture. All are relatively well supplied with plant nutrients when compared with other soils of the county, and all are responsive to fertilization for some crops. They are usually slightly deficient in lime, although they contain more than most other soils of the county. All are well drained; their physical properties are such that they retain moisture well, thus maintaining an adequate and even moisture supply for plant growth. Good tilth is easily obtained and maintained, and the range of moisture conditions for tillage is comparatively wide. The soils are fairly well supplied with organic

matter in comparison with others of the county. The physical properties of these soils favor normal circulation of air and moisture. Roots penetrate all parts of the subsoil freely.

None of these soils has any prominent adverse soil condition. They are almost free of stone, the relief is favorable to soil conservation and tillage, and none is severely eroded or highly susceptible to erosion. The natural fertility is relatively high. They are easily tilled, and the problem of conservation of soil fertility and of the soil material itself is relatively simple. The First-class soils of the county are identified in the last column of table 6.

SECOND-CLASS SOILS

Second-class soils are physically good soils for agriculture. They are fair to good soils for crops requiring tillage and fair to excellent soils for permanent pasture. They are moderately productive of most of the crops commonly grown in the area. Their physical properties are moderately favorable for tillage and for maintenance of good tilth and normal circulation and retention of moisture. None has slopes greater than 12 to 15 percent, none is sufficiently cherty to interfere seriously with tillage operations, and none is severely eroded. Although each is moderately deficient in one or more properties that contribute to productivity, workability, or conservability, none is so seriously deficient in any property that the soil is poorly suited to use for crops that require tillage.

The deficiencies vary widely among the soils. Some are fertile but sloping and moderately eroded; others are almost level and uneroded but are relatively low in content of plant nutrients or have restricted drainage. The management requirements differ widely because of the many kinds of soils included. The soils of the group are relatively similar in their suitability for agriculture, although the necessary management practices are different. The Second-class soils are identified in the last column of table 6.

THIRD-CLASS SOILS

The Third-class soils are physically fair soils for agriculture; they are poor to fair for crops requiring tillage and are fair to very good for permanent pasture. Each soil is so deficient in workability, conservability, or productivity, or in some combination of the three that the physical suitability of the soil for crops that require tillage is definitely limited. These soils are better suited to crops that require tillage than are Fourth-class soils but are less suited than Second-class soils. Conditions that affect physical suitability for crops include low content of plant nutrients and of organic matter, low water-holding capacity, undesirable texture, structure, or consistence, strong slope gradient, chertiness, or inadequate natural drainage. One or more of these conditions present in a soil limits its physical suitability for tilled crops. Because of the diversity of characteristics among the soils of this group, management requirements vary widely. Soils of the Third-class are identified in the last column of table 6.

FOURTH-CLASS SOILS

Fourth-class soils are physically poorly suited to crops requiring tillage and are poor to very good soils for permanent pasture. They

are poor soils for agriculture mainly because of the limited number of uses to which they are well suited. Some of them may be most important on some farms, however, if soils suited to permanent pasture are in great demand.

Each soil of this group is so difficult to work or so difficult to conserve, or both, that management practices necessary for its successful use for crops requiring tillage are not feasible under present conditions. On some farms, however, soils well suited physically to crops that require tillage may be so limited that it is good farm management to practice the intensity of soil management necessary for the successful use of Fourth-class soils for those crops. They are generally used for pasture on farms where an adequate crop acreage is available. A considerable acreage is used for crops, mainly on farms where soils better suited to crops exist in acreages too small to satisfy the needs of the farm unit. The intensity of management practiced on the areas used for crops is generally inadequate for good soil conservation. As on the Third-class soils, the management requirements vary widely both for crops that require tillage and for pasture. Fourth-class soils are identified in the last column of table 6.

FIFTH-CLASS SOILS

Fifth-class soils are very poorly suited to agriculture—they are very poor for crops and poor to very poor for permanent pasture. Each is so difficult to work and to conserve or so low in productivity that use for tilled crops is impractical. Likewise, each soil has such a low plant-nutrient content or poor moisture relation, or both, that common pasture plants produce very little feed. These soils are apparently best suited to forest under present conditions, although they are less productive of forest than soils of any of the preceding groups. Where a farm is short of better soils, the operator may be forced to use some of these soils for pasture or crops, in spite of the fact that they are poorly suited to them. The Fifth-class soils are identified in the last column of table 6.

SOIL USE AND MANAGEMENT⁴

The conditions of workability, conservability, and productivity may place two soils in the same land class or physical use-suitability group, but because of differences in their departure from the ideal, they may differ considerably in management requirements. One soil may require practices to improve workability and another practices for increasing productivity. The soils of the area are placed in 15 groups based on similarity of management requirements.

The management requirements of soils of each group are discussed with respect to two broad uses: (1) Crops that require tillage and (2) permanent pasture. Management requirements are discussed in terms of one or more rotations well suited to the soils. The management of the soil for one crop of the rotation generally has an effect on the

⁴The term "soil use" refers to broad use classes as (1) crops that require tillage; (2) permanent pasture; and (3) forest. The term "soil management" refers to such practices as (1) choice and rotation of crops; (2) application of soil amendments, as lime, commercial fertilizer, manure, and crop residue; (3) tillage practices; and (4) engineering practices for the control of water on the land.

production of other crops in the rotation. Management requirements for each crop are therefore dependent not only on the properties of the soil and characteristics of the crop but also on the management that has been practiced on other crops in the rotation.

Experimental data on which to base recommendations for the use or management of many of the soils of the county are not entirely adequate. Recommendations for best soil use and management on a particular farm involve consideration of so many conditions that apply only to that particular farm that they cannot be made to apply to the conditions of a large area, such as a county. Consequently, this material is limited chiefly to a discussion of the deficiency of soils so that persons who have the other necessary information may interpret it into recommendations for particular areas.

Good management practices under conditions that exist on many farms in the area are suggested. These practices are to be used as the definitions of management for columns B of the table of expected yields. They represent one or more kinds of good management, but other combinations of management practices may attain the same objective of production. The proper choice depends upon conditions of the particular farm. For example, nitrogen may be maintained by the use of legumes, manure, commercial fertilizer, or combinations of the three. The best method for maintaining this element depends on the type of farm as well as on soil conditions.

The following groups of soils are based on similarity of management requirements for crops that require tillage. To avoid a second grouping for pasture, management requirements for permanent pasture, which are generally similar among the soils of each group, are discussed.

GROUP 1

Group 1 includes Ennis and Huntington silt loams and Shannon fine sandy loam and silt loam. These good to excellent crop and pasture soils are all high to very high in productivity and are easily to very easily worked and conserved. They are nearly level and not subject to erosion. All are relatively high in lime, organic matter, and plant nutrients and are replenished periodically by fresh sediment. Moisture conditions are favorable for plant growth. The soils are well drained, but because they are subject to flooding, chiefly during the winter and spring months, they are limited in use suitability.

Management requirements.—The soils of group 1 are suited to intensive use but are largely limited to summer-annual crops. They are well suited to corn and many forage crops and very well suited to the summer-annual hay crops, lespedeza, and soybeans. Fertilizer or lime is not needed to continue the usual high yields of suitable crops. Corn yields are increased in some areas by using a short rotation that includes a legume crop to be turned under. The management of these soils includes improving tillage practices and more timely seeding of high yielding varieties. Although fertilizer is not ordinarily used on these soils, nitrogen will generally increase corn yields, and lime applications are usually effective in increasing yields of legumes, especially on the Shannon and Ennis soils.

These soils are particularly well suited to pasture, chiefly because of very favorable moisture relations and relatively high fertility.

They are, however, subject to flooding, which may damage the vegetation by the deposition of mud. Weedy vegetation is vigorous and constitutes a definite detriment to pasture production. The generally smooth surface of the soils greatly facilitates the eradication of the weedy growth by mowing. Pasture responds to treatment with lime and fertilizer, but its requirement for such treatment is not exacting.

GROUP 2

Group 2 includes Alva and Sequatchie fine sandy loams; Dexter silt loam, eroded undulating phase; and Humphreys silt loam. These good to excellent crop and pasture soils are high in productivity and are easily to very easily worked and conserved. They have mild slopes, are not seriously eroded, and are not very susceptible to erosion. All are relatively high in organic matter and plant nutrients, compared with the soils of the uplands, and all have moisture conditions favorable for plant growth. In spite of the favorable properties, the soils are of relatively little agricultural importance because of their small total acreage.

Management requirements.—The soils of group 2 are suited to intensive use and a wide variety of crops, including corn, cotton, small grains, alfalfa, red clover, crimson clover, sweetclover, and various vegetables. When other management requirements are met, they can be conserved and their productivity maintained or increased under rotations including a row crop every third year, if the rotation includes a legume. Winter cover crops and green-manure crops are useful as a means of conserving soil moisture, in improving tilth, and as a source of nitrogen and humus.

The soils of group 2 are generally slightly to moderately deficient in lime, phosphorus, and nitrogen. Properly conserved manure is an excellent source of both nitrogen and potash, but it should be supplemented with a phosphate fertilizer to obtain a balance of plant nutrients. Corn, cotton, and small grains respond well to applications of a complete fertilizer. The legumes, especially deep-rooted ones, require lime and phosphorus, but, if inoculated, no nitrogen is needed. An inoculated legume crop will generally supply the nitrogen needed for other crops in a short rotation, especially if turned under.

Good tilth is easily maintained, and tillage operations can be carried on over a fairly wide range of moisture conditions without seriously impairing the physical properties of the soils. Controlling erosion and conserving soil moisture are not serious problems when crops are properly chosen and adequate amendments are used. Mechanical devices for controlling erosion are not generally needed, but contour tillage is a good practice wherever feasible.

Even though the soils of group 2 are very well suited physically to pasture, their use for this purpose is largely precluded because they are so well suited to more intensive use. When used for pasture, the management is concerned chiefly with supplying amendments, chiefly lime and phosphorus, to suitable pasture plants. Other requirements include proper control of grazing and scattering of droppings. On pastures that are given adequate amendments and are properly grazed, the problem of weed control is not serious, but mowing may be necessary to remove excess herbage and undesirable plants.

GROUP 3

Group 3 includes imperfectly drained soils of the colluvial lands—Briensburg silt loam and Eupora fine sandy loam. These are good crop soils and good to excellent pasture soils. They are not generally subject to overflow by any stream, but they do receive additional sediments from the adjacent upland slopes. The soils are strongly to very strongly acid, medium in organic matter, and moderately low in most plant nutrients. All have friable permeable profiles, and moisture relations for plant growth are good except in wet seasons. The soils are in small individual areas but are very important to the farms on which they occur, chiefly because they are associated with much less productive soils of the uplands. They are somewhat limited in use suitability by imperfect drainage but are suited to most of the common crops of the county, including corn, cotton, lespedeza, sweetclover, and sorghum. They are less well suited to red clover or crimson clover and are very poorly suited to alfalfa.

Management requirements.—Although suited to intensive use, fertilization and a short rotation that includes a legume are generally necessary to maintain or increase crop yields. A 4-year rotation of wheat, legumes and grass, corn, and soybeans is suitable for these soils. Another good 4-year rotation consists of wheat, sweetclover, and corn. In this rotation other small grains can be substituted for the wheat and sorghum, and cotton or vegetables for the corn. Longer rotations suitable for use include 2 to 4 years of grass and legumes mixed and 1 or 2 years of a cultivated crop. A mixture of lespedeza, alsike clover, redtop, timothy, and orchard grass, or a mixture of only some of these, can be grown for hay or pasture.

Fair crop yields are obtained without fertilization, but to increase yields and maintain them at a high level, most of the common fertilizing elements are needed. Lime, phosphate, and possibly potash are needed for the legume crops, especially the deep-rooted ones. The legume crop, if turned under, should supply adequate nitrogen for most other crops in the rotation. Barnyard manure, if available in sufficient quantities, is an excellent source of nitrogen, potash, and organic matter. Phosphorus is probably needed for all crops. The cash crop, chiefly cotton, requires a complete fertilizer. On most areas potash is especially needed to aid in controlling rust on the cotton.

All these soils are easily maintained in good tilth, although tillage operations may be delayed in spring because of unfavorable moisture conditions caused by imperfect drainage. The use suitability and general productivity of these soils can be improved by artificial drainage, but the advisability of drainage depends on many factors other than the response of the soil. The imperfect drainage, in most places, is apparently caused by seepage from the adjacent upland slopes; intercepting tile drains or open ditches would be expected to improve the drainage.

These soils are well suited to pasture, chiefly because of their very favorable moisture relations. Pastures, however, can be greatly improved by proper fertilization and seeding. Lime and phosphorus are required if good pastures are to be established and maintained. With proper fertilization, a mixture of orchard grass, redtop, bluegrass, white clover, hop clover, and lespedeza is suitable. Weeds are com-

mon on these soils and are detrimental to the pasture because they compete for moisture and crowd out desirable pasture plants. Periodic mowing will aid in keeping down the weed growth.

GROUP 4

Group 4 includes Hymon fine sandy loam and silt loam, Lindside silt loam and silty clay loam, and Lobelville silt loam. These are good crop soils and good to excellent for pasture. As a group they are moderate in productivity, easily worked, and very easily conserved. All are imperfectly drained soils of the first bottom and are subject to overflow. The soils vary in content of lime, organic matter, and plant nutrients, but all are better supplied than the associated soils of the uplands. Fresh sediment deposited by the floodwaters aids in maintaining the supply of plant nutrients and organic matter. Imperfect drainage and susceptibility to flooding limit the variety of crops that can be grown. Many feed and forage crops, as corn, soybeans, alsike clover, redtop, and white clover, are expected to do well. The soils are poorly suited to alfalfa, red clover, small grains, and cotton. Adequate supplies of moisture are generally available for plant growth, and crops are not injured by droughts so often as on the adjacent uplands.

Management requirements.—Favorable workability and conservability make these soils suitable for intensive use. Row crops can be grown every year or in alternate years, but a leguminous green-manure crop is needed in many places to maintain the supply of organic matter and nitrogen. Where practical, a short rotation of corn and hay crops is desirable.

Even though these soils receive annual increments of soil material, they are generally deficient in lime, phosphorus, potash, and nitrogen. All crops except legumes need a complete fertilizer. Legumes need phosphorus and potash but no nitrogen. Lime is necessary in many places to obtain satisfactory stands of legumes, and it increases the yields and improves the quality of the following crops.

All these soils are easily maintained in good tilth except Lindside silty clay loam, but tillage may be delayed early in spring and during rainy seasons because of unfavorable moisture conditions caused by imperfect drainage. These soils are not ordinarily susceptible to erosion, but it may be necessary to build up stream banks in some places to prevent scouring. The range of use suitability and general productivity of these soils can be increased by artificial drainage, but the advisability of drainage and the kind of drains to use on any particular area will depend upon many factors, including cost, feasibility of drainage from an engineering standpoint, and kinds and quantities of other soils on the farm.

The soils of group 4 are well suited to pasture. Fairly good pasture can be obtained by simply preparing the seedbed and seeding. The use of lime and phosphorus, however, will improve the quality and increase the pasture yields. Some mixture of redtop, orchard grass, white clover, hop clover, alsike clover, and lespedeza is suited to these soils. Control of grazing is important during the wet seasons to prevent injury to pasture by trampling and injury to the physical properties of the soils. Mowing to eradicate weeds and remove excess herbage is necessary on pastures on these soils.

GROUP 5

Egam silty clay loam, the only soil in group 5, is a soil of the first bottoms and is subject to periodic overflow. Compared with other soils of the county, the content of lime, organic matter, and plant nutrients is high. The supply of moisture for growing plants is low, however, and crops are very susceptible to injury from droughts. Because of this susceptibility to overflow and droughts, the use suitability is very limited. The soil is well suited to soybeans, lespedeza, sorgo, and spring oats, poorly suited to corn, and unsuited to cotton, small grains, or crimson clover, alfalfa, or red clover.

Management requirements.—This soil is suited to intensive use for the crops grown. Crop yields can be maintained under continuous cropping without fertilization. The management will be concerned chiefly with the selection of drought-resistant varieties and improved seedbed preparation and tillage practices. The tilth is poor and the soil can be cultivated over a very narrow range of moisture conditions; consequently, the seedbed is often insufficiently prepared, and tillage practices are frequently poorly timed and inadequate. A well-prepared seedbed will promote better germination of seed and a better early growth of crops. The use of a rotation that includes a legume and plowing under green-manure crops would improve the tilth as well as the productivity.

The soil is fairly well suited to pasture, but its associations are such that it is rarely used for that purpose. Fair pasture can be obtained by preparing the seedbed and seeding.

GROUP 6

Group 6 includes Humphreys and Ennis cherty silt loams and the rolling and undulating phases of Greendale cherty silt loam. These are alluvial and colluvial soils characterized by a high content of chert on the surface and throughout the profile. The Humphreys soils are flooded at infrequent intervals; and the Ennis soils are subject to flooding for very short periods at frequent intervals; the Greendale soils are not commonly flooded by any stream.

The soils are medium to very strongly acid and moderate in content of organic matter and plant nutrients. Internal drainage is rapid, and the water-holding capacity is low. They are fairly well suited to most of the common crops of the county, but their suitability is limited somewhat by chertiness and droughtiness. They are very well suited to early vegetable crops; and are well suited to small grains, crimson clover, and vetch. They are not so well suited to crops that mature late in summer or in fall.

Management requirements.—These soils are suited to intensive use, but to maintain or increase yields crop rotation and fertilization are required. The rotation can be short but should include a legume. A rotation, of wheat or other small grains and clover, red clover, and corn, is suitable for these soils. Peanuts or other row crops can be substituted for the corn; sweetclover, alfalfa, or lespedeza, for the red clover.

Although these soils are younger and less leached than the associated soils of the uplands, they are generally moderately deficient in phosphorous, nitrogen, and probably potash. All crops need phosphorus; the corn, small grains, and grasses need nitrogen and possibly

potash. Properly inoculated legumes and legume-grass mixtures need no nitrogen, but they do require phosphorus and potash. Lime is needed in most places to maintain good stands of the deep-rooted legumes. Barnyard manure is an excellent source of nitrogen, potash, and organic matter for all crops.

The soils are not susceptible to erosion in many places, but tillage should be on the contour on the more sloping areas. The high content of chert interferes materially with tillage. In places, it may be practical to remove the larger surface chert fragments and thus improve the workability of the soils.

The soils of this group are fair to good for pasture, and a large portion of it is used for this purpose, chiefly because the soils are near the barnyard. Pastures are very good early in the year but are generally poor late in summer and fall. Some mixture of bluegrass, redtop, orchard grass, white clover, red clover, hop clover, and lespedeza is well suited to these soils. Pasture management is concerned chiefly with supplying lime, phosphorus, and potassium to properly selected pasture mixtures; properly controlling grazing; scattering of droppings; and mowing to remove excess herbage and to eradicate weeds.

GROUP 7

Group 7 includes the undulating and eroded undulating phase of Dickson silt loam; Dulac silt loam undulating and eroded undulating phases; Freeland silt loam undulating and eroded undulating phases; Lax silt loam, eroded undulating phase; Paden silt loam, undulating phase; Providence silt loam undulating and eroded undulating phases; Wolftever silt loam; and Wolftever silty clay loam, eroded phase. The soils of group 7 have more exacting management requirements than those of the groups previously discussed, especially in regard to fertilization and the choice and rotation of crops.

These soils are physically suitable for crop production but are naturally low in fertility. They have good tilth, have gentle slopes, are free of gravel or stone, and consequently they are easy to work. On the other hand, they are low in organic matter and plant nutrients and are strongly to very strongly acid. All have silt pans that interfere with water movement and restrict root penetration. Chiefly because of low fertility and low water-holding capacity, these soils are low in productivity and somewhat limited in use suitability. Deep-rooted crops, as alfalfa, do not succeed so well as on soils that are penetrable to a greater depth. The soils are fairly well suited, however, to most crops commonly grown, as cotton, corn, lespedeza, cowpeas, sericea lespedeza, redtop, and sweetpotatoes. Fertilizer and lime are required to establish stands of alfalfa, sweetclover, and red clover.

Management requirements.—These soils are suited to moderately intensive use. When other management requirements are met, they can be conserved under rotations including a row crop once in 3 to 5 years. In managing these soils, it is important that the kind of crops grown and the crop rotation practiced be chosen to suit their capability. As these soils are relatively low in organic matter and nitrogen, the rotation should include a legume to aid in supplying these deficiencies, and a growing crop should be on the land as much of the time as possible to help prevent leaching of nitrogen and other soluble plant

nutrients. All legumes probably should have grass with them to help conserve the nitrogen fixed by the legumes, and all pasture-grass mixtures should contain legumes to supply the nitrogen needs of the grasses.

A rotation suitable for these soils is as follows: Wheat, grass, and legumes (3 years), corn followed by a cover crop, and cotton. A 3-year rotation of small grains, lespedeza, and corn is also suitable for these soils. A 4-year rotation that can be used includes the following: Wheat or other small grain; red clover; corn followed by a cover crop; and soybeans. In these rotations, barley, rye, or oats can be substituted for wheat; and sorgo, cotton, or sweetpotatoes, for corn. Vetch or crimson clover can be used for the cover crop, although vetch is apparently better suited to the soils.

Fertilizer and lime are important on these soils. All crops need phosphorus and possibly potassium. Nitrogen, which can generally be best obtained by the growth and proper use of legumes, is needed by all except the legume crop. Nitrogen fertilizer sometimes may be profitable on cash crops and as a top dressing on the small-grain crop. Lime is essential for the deep-rooted legume crops, and if applied to these crops, it will prove beneficial to all other crops in the rotation. Lime and phosphate are necessary to establish and maintain stands of alfalfa and sweet clover; smaller quantities are required for red clover, but are essential for this crop. Lespedeza and sericea lespedeza are grown without amendments, though they are needed for best results.

If other management practices are good, special practices for runoff and erosion control should not be necessary. All tillage should be on the contour, however, insofar as practicable, and cover crops should follow all clean-cultivated crops.

The soils of this group are suited to pasture, although pasture yields are not very high, chiefly because of low water-holding capacity and low fertility. Pastures, however, can be greatly improved by proper fertilization and seeding. Lime and phosphorus are required if a good pasture is to be established and maintained. With proper fertilization, a mixture of orchard grass, redtop, white clover, hop clover, red clover, and lespedeza is well suited. Periodic mowing is necessary to control weeds, and grazing needs to be controlled to maintain a good sod at all times.

GROUP 8

Group 8 includes the eroded rolling phases of Dexter, Dickson, Dulac, Freeland, Lax, Paden, and Providence silt loams and Savannah very fine sandy loam; the rolling phases of Dickson, Dulac, Freeland, Lax, and Providence silt loams and Savannah very fine sandy loam; and the eroded rolling shallow and rolling shallow phases of Mountview silt loam.

The management requirements of the soils of group 8 are more exacting than those of group 7, chiefly because of the stronger slope (5 to 15 percent). The soils are low in organic matter and plant nutrients and are strongly to very strongly acid. All except the Mountview and Dexter soils have siltpans that interfere with water movement and restrict root penetration. Chiefly because of low fertility, low water-holding capacity, and presence of siltpan, these soils are relatively low in productivity and limited in use suitability. The soils are fairly well

suited to the common crops grown in the county, as cotton, corn, small grains, sericea lespedeza, and sweetpotatoes. They are apparently better suited to the small-grain crops than to corn. Without special fertilization, they are poorly suited to red clover, alfalfa, and sweet-clover. Even under the best management, the stand of alfalfa is often difficult to maintain.

Management requirements.—The soils of group 8 are highly susceptible to erosion and to great injury from erosion, and they will therefore require moderately long rotations consisting largely of close-growing crops. A rotation apparently suitable for these soils is as follows: Wheat, grass, and legumes (3 years), and corn. If alfalfa, sericea lespedeza, or sweetclover is used as the legume crop, it probably should be allowed to remain 4 years if the stand can be maintained. In this rotation barley, rye, or oats can be substituted for wheat; sorgo, cotton, or sweetpotatoes, for corn.

Fertilizer and lime are very important if yields are to be maintained or increased. The soils are low in all the major fertilizing elements, including lime, and the management is concerned with supplying adequate quantities for the growing crops. Phosphorus and most of the potash must be supplied in commercial fertilizer. Barnyard manure is an important source of nitrogen, potash, and organic matter. Nitrogen can generally be best obtained by the growth and proper use of legumes. Nitrogen fertilizer is sometimes profitably used on cash crops and as a top dressing on the small-grain crop. Lime and phosphorus are essential for success with the deep-rooted legume crops, as alfalfa, sweetclover, and red clover. Lespedeza and sericea lespedeza are grown without amendments, but amendments are needed for best results.

Management practices should be concerned particularly with control of runoff and erosion. The proper selection and rotation of crops, together with the use of soil amendments, are partly effective in controlling runoff, but some special practices are needed in many places. Contour tillage is an effective aid, and on the longer slopes, strip cropping is advisable. In some places properly planned and constructed terraces that are carefully maintained are also effective.

The soils of group 8 are suited to pasture, but pasture yields are low, chiefly because of low fertility and low water-holding capacity. Pastures, however, can be greatly improved by proper fertilization and seeding. Lime and phosphate are required if good pastures are to be established and maintained. With proper fertilization, some mixture of orchard grass, redbud, white clover, hop clover, red clover, and lespedeza is well suited. Grazing will need to be carefully controlled to maintain a good sod, and periodic mowing is necessary to control weeds.

GROUP 9

Bruno loamy fine sand, the only soil in group 9, occupies the first bottoms and is characterized by extreme sandiness. It is an excessively drained soil subject to periodic overflow and moderate to low in content of organic matter and plant nutrients. Internal drainage is rapid to very rapid, and the water-holding capacity is very low. The use suitability is limited by the susceptibility to overflow. It is fairly well suited to corn, peanuts, lespedeza, soybeans, and many other hay and forage crops.

Management requirements.—The management of this soil is concerned chiefly with the selection of drought-resistant crops and the addition of the needed fertilizers, especially nitrogen. A short rotation of corn, lespedeza, lespedeza is suited to this soil. Peanuts can be substituted for the corn in the rotation and soybeans or cowpeas for the lespedeza. The crops are all expected to respond well to phosphorus and nitrogen. The legume crop should supply adequate nitrogen for the other crops in the rotation.

This soil can be cultivated over a very wide range in moisture conditions. Tillage, especially with a tractor, is difficult because of the loose sandy surface layer. The soil is poorly suited to pasture, chiefly because of the low water-holding capacity and low fertility; it is also associated with soils that are seldom used for pasture.

GROUP 10

Group 10 includes Hatchie and Taft silt loams, both of which are poor to fair cropland and fair to good pasture land. They are moderately productive and have good conservability and workability, but they are imperfectly drained and characterized by a hardpan layer at a depth of about 2 feet. Both are strongly to very strongly acid and low in organic matter and plant nutrients. The soils absorb moisture readily, but their hardpan layer restricts water movement, and they are characterized by being alternately wet and dry. Moisture conditions for growing crops are moderately unfavorable, and crops suffer both from excessive moisture and from droughts. Because of the imperfect drainage, the low water-holding capacity, and the siltpan that restricts root penetration, these soils are limited in use suitability: They are not well suited to deep-rooted legumes, cotton, sweetpotatoes, or any of the winter crops such as small grains, crimson clover, or vetch; they are fairly well suited to sorghum, corn, lespedeza, and soybeans.

Management requirements.—The management of these soils is concerned chiefly with selection of crops suited to alternate wet and dry conditions, the supplying of needed amendments, and the improving of drainage, thereby increasing the use suitability. The soils can be conserved under rotations including a row crop once in 3 years if other requirements are met. A rotation of corn, redtop, and alsike clover or lespedeza (2 years) is well suited to them. A cane crop or soybeans can be substituted for the corn; white clover or sericea lespedeza for the clover. Where the demand for row crops is great, they can be successfully grown in alternate years if the soils are carefully managed in other respects.

In general the soils of group 10 are deficient in lime, phosphorus, potash, and nitrogen. Corn and small grains need complete fertilizers; legumes and legume-grass mixtures for hay or pasture need phosphorus and potash, but no nitrogen if properly inoculated. Lime is essential to success with the legumes, and all crops in the rotation will be benefited by its use.

Plowing and other tillage operations may be delayed in spring because of unfavorable moisture conditions, but otherwise all operations can be easily accomplished on these soils. None of these soils is susceptible to serious erosion. It is probable that some measures for improving surface drainage can be used profitably. Unless tile can be laid above the hardpan, it is improbable that tile drainage would

be effective. A combination of open ditches and bedding possibly would be the best method for improving drainage.

These soils are fairly well suited to pasture although too droughty to sustain good grazing during many summer and fall seasons. Lime and fertilizer are necessary for establishing good pasture. A mixture of white clover, lespedeza, hop clover, redtop, and orchard grass is suitable for pasture.

GROUP 11

Group 11 includes the rolling phases of Bodine cherty silt loam, Safford very fine sandy loam, and Shubuta fine sandy loam; and Safford clay loam, eroded rolling phase. They are poor to fair cropland and fair to good pasture land. Although physically fairly well suited to crops, their associations make it impractical to cultivate them in many places. Practically all are on narrow winding ridge crests associated chiefly with Fifth-class soils; all have very poor tilth, especially after they are eroded. The Bodine soils are characterized by a high content of chert, and the Safford and Shubuta by heavy-textured plastic subsoils. All, except the Bodine soils, are very susceptible to erosion and to great injury from erosion. The content of organic matter plant nutrients is variable; the Bodine and Shubuta soils are low and the Safford soils are medium in this respect, as compared with other soils of the county. All are strongly to very strongly acid. They are poorly to fairly well suited to most of the crops grown.

Management requirements.—If these soils are to be used for crops, the rotation should be long, should consist largely of close-growing crops, and should include legumes and grasses. A suitable rotation is as follows: Wheat, legume and grass mixture (3 years), and corn. Other small grains could be substituted for the wheat and cotton, soybeans or other row crops for the corn. It is especially important that a cover crop follow each clean-cultivated crop.

The different soils of group 11 vary greatly in their need for fertilizer, but all need lime and some fertilizer. All crops except those on the Safford soils will need phosphorus and nitrogen and possibly potash. Lime and phosphorus are essential for the deep-rooted legume crops. Nitrogen is most economically supplied by properly inoculated legumes in the rotation. Barnyard manure is an excellent source of nitrogen and potash, and the organic matter applied in the manure greatly aids in improving tilth.

Favorable tilth is moderately difficult to maintain, and the range of moisture conditions for tillage is rather narrow. If the soils are plowed in fall, freezing and thawing will improve tilth, but this advantage is more than offset by the increased erosion. When the soils are in close-growing grass and small-grain crops much of the time, runoff and erosion are greatly reduced, although further measures are generally required. Contour tillage should be practiced wherever possible; terraces are generally not practicable.

All these soils are fairly well suited to pasture, which may be bluegrass, orchard grass, redtop, white clover, or lespedeza. Bermuda grass can be used to advantage for a permanent pasture sod. Lime and phosphorus are needed to establish good pasture, and additional supplies are needed periodically to maintain them. Grazing control is necessary, especially during dry season, and clipping is necessary to eradicate weeds.

GROUP 12

Group 12 includes Almo, Melvin, and Robertsville silt loams and Beechy fine sandy loam and silt loam. These soils are poorly suited to crops but are fair to very good pasture lands; they are all poorly drained and are on nearly level to slightly depressed areas. The Melvin and Beechy soils are on stream bottoms and the Robertsville and Almo on stream terraces. The Melvin and Beechy soils vary considerably both in fertility and in reaction; the Robertsville and Almo are low in fertility and strongly to very strongly acid.

Under natural drainage conditions these soils are considered poorly suited to crops requiring tillage. They are suitable for pasture, although it is recognized that the Almo and Robertsville are rather low in productivity of pasture plants. The soils could be improved by artificial drainage, and if adequately drained would be suitable for crops requiring tillage; but draining the Almo and Robertsville soils is difficult and of doubtful feasibility.

Management requirements.—These soils furnish pasture throughout spring, summer, and fall; but the quality is poor to fair and the carrying capacity is low to medium. The first step in pasture improvement should be directed toward improving moisture conditions. This can be accomplished largely through the use of open ditches, which are effective in removing much of the surplus surface water. After drainage has been improved, seedings of bluegrass, white clover, redtop, lespedeza, and Bermuda grass can be expected to do fairly well if lime and phosphate are used. Redtop and lespedeza can be grown without amendments, but the pastures obtained are of low quality. Weeds should be controlled by grazing and mowing.

In general, although poorly suited to crops requiring tillage, these soils are good to excellent for the production of sorghum for sirup. If planted late in spring and harvested just before frost, only an occasional crop is lost because of excessive moisture or flooding. In most places, a good response is obtained from the use of a complete fertilizer. These soils, especially those of the first bottoms, are fairly well suited to soybeans for hay.

GROUP 13

Group 13 includes the severely eroded rolling phases of Dickson, Dulac, Providence, and Lax silty clay loams and of Freeland and Savannah clay loams; Mountview silty clay loam, severely eroded rolling shallow phase; and Tippah silt loam, eroded rolling phase.

These soils are poorly suited to crops requiring tillage, chiefly because of injury from erosion and susceptibility to further erosion. They are very low in organic matter, plant nutrients, and water-holding capacity. Their best use is for pasture or forest.

Management requirements.—If the soils are to be used for pasture, the management requirements for pasture already established will consist chiefly of the periodic application of lime, phosphate, and possibly potash, and the control of weeds. Occasional reseeding may be necessary, but if fertilization is adequate, if grazing is properly controlled, and if weeds are systematically eradicated, reseeding should not be necessary; on the contrary, the pasture would be expected to improve with age. If the pasture is not yet established, the soils present a difficult problem in management. Poor tilth, the tendency to clod and bake, slow absorption of moisture, low water-holding capac-

ity, and extreme deficiency in organic matter and plant nutrients, make the establishment of pastures difficult. Where gullied, check dams may be necessary or diversion ditches or terraces may be advisable. Lime, phosphate, and possibly potash and nitrogen are necessary in getting vegetation established. Pasture mixtures containing a considerable proportion of drought-resistant plants should be seeded.

It is not unlikely that after a few years in a well-managed pasture, the soils will be suited to crops. If so, the management requirements would be similar to those of soils in group 8.

GROUP 14

Group 14 includes the eroded hilly phases of Bodine cherty silt loam and Safford clay loam; the hilly phases of Bodine cherty silt loam, Lexington-Ruston complex, and Safford very fine sandy loam; and the eroded hilly shallow and hilly shallow phases of Mountview silt loam. Because of one or more unfavorable characteristics, as chertiness, strong slope, low fertility, poor tilth, or extreme susceptibility to erosion, these soils are poorly suited to crops requiring tillage. They are probably best used and managed in pasture.

Management requirements.—Although these soils are not naturally productive of pasture, indications are that pastures can be established and maintained by good management. Lime, phosphate, and possibly potash will be needed to establish them on some soils. Nitrogen may also be necessary. If properly fertilized the soils of this group are suited to pasture plants such as bluegrass, orchard grass, redtop, white clover, red clover, hop clover, and lespedeza. Bermuda grass also can be used to advantage in many places. Grazing needs to be controlled carefully to maintain a good sod at all times. Periodic applications of lime and phosphate and clipping pastures to control weeds will be necessary.

GROUP 15

Group 15 includes the severely eroded hilly phases of Bodine cherty silt loam, Cuthbert clay loam, Lexington-Ruston complex, Ruston sandy clay loam, and Safford clay loam; the steep phases of Bodine cherty silt loam, Cuthbert fine sandy loam, Guin gravelly loam, Ruston fine sandy loam, and Safford very fine sandy loam; the eroded hilly phases of Cuthbert clay loam and Ruston fine sandy loam; the hilly phases of Cuthbert fine sandy loam, Guin gravelly loam, and Ruston fine sandy loam; Guin gravelly loam, rolling phase; Hilly stony land (Talbot and Colbert soil materials); Rough gullied land (Cuthbert soil material); and Rough gullied land (Ruston soil material).

All the soils have some combination of undesirable features, as steepness, chertiness, stoniness, low fertility, or high susceptibility to erosion. They are not only unsuitable for crops but also very poorly suited to pasture. They are probably best used for forest.

Management requirements.—A large proportion of these soils is in forest, and in general a reforestation program should be carried out on the remaining acreage. In places a suitable forest cover will establish itself if properly protected against fire and grazing; in others, planting will be necessary. Shortleaf pine is one of the more suitable species for planting on the exposed or otherwise less favorable growing sites. On the better sites, that is, on sites where moisture relations are more favorable for plant growth, other species may be more desirable. Those

interested in forest planting or forest management should consult their extension forester or State forester.

Most of the management practices employed in the production of forest may be grouped as follows: (1) Maintenance of a full stand of desirable species, (2) systematic cutting and culling of trees, (3) harvesting mature trees in such manner that desirable species may succeed them, and (4) the control, so far as possible, of fires, browsing, trampling, and damage from other causes.

ADDITIONAL MANAGEMENT INFORMATION

The Tennessee Agricultural Experiment Station, the Agricultural Extension Service, and the University of Tennessee have issued many publications, bulletins, and circulars relating to the soils and crops of Tennessee. Some of the information in these publications is related to specific soils and crops, but much of it is of a more general nature and should be carefully studied before it is applied to any specific soil or crop. The list includes many of these publications, the material of which has been freely used in the preparation of this report.

Tennessee Agricultural Experiment Station bulletins:

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| 78. The Soils of Tennessee | 176. A New Explanation of What Happens to Superphosphate in Limed Soils |
| 114. The Oat Crop | 191. Depth and Method of Soil Preparation and Cultivation for Corn and Cotton |
| 141. The Comparative Values of Different Phosphates | 200. Effects of Lime, Fertilizer, and Preceding Legumes on the Yields of Corn and Tobacco |
| 142. The Effects of Various Legumes on the Yield of Corn | |
| 149. Fertilizers and Manure for Corn | |

Tennessee Agricultural Experiment Station circulars:

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| 5. The Soils of Tennessee | 34. Increasing the Profits from Phosphate for Tennessee Soils |
| 6. The Value of Farmyard Manure | 45. Balbo Rye |
| 10. A Select List of Varieties of Farm Crops | 49. Korean Lespedeza |
| 11. Rates and Dates of Planting for Tennessee Farm and Garden Crops | 52. Rye for Pasture and Seed in Tennessee |
| 33. The Effect of Certain Soil Conditions on the Yield and Quality of Burley Tobacco | 60. Fertilizers for Tennessee Soils |

Tennessee Agricultural Experiment Station leaflets:

19. Soybean Seed Production in Tennessee

Tennessee College of Agriculture Extension Service publications:

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| 133. Lime and Prosperity of the Farm | 214. Small Grain in Contour Furrows on Lespedeza Sod |
| 144. The Farm Woodland in Tennessee | 216. Making High Quality Hay |
| 161. Burley Tobacco Culture | 217. A Pasture Program for Tennessee Farms |
| 188. Winter Cover Crops for Pasture and Soil Conservation | 218. Farming Terraced Fields |
| 197. A Land Use and Soil Management Program for Tennessee | 219. Plowing for Terrace Maintenance |
| 208. Lime, Phosphate, and Legumes in an Agricultural Conservation Program | 227. Field Mechanics of Terracing |
| 209. The Place of Terraces in Tennessee Agriculture | 228. Terrace Outlet Waterways |
| 210. Increasing Farm Returns | 233. How to Build and Conserve Your Soil with the Aid of the AAA |
| 213. Alfalfa in the Tennessee Farm Program | 234. Conservation and Use of Manure on Tennessee Farms |
| | 245. Planning the Farm Lay-out and Cropping System |

Tennessee College of Agriculture, University of Tennessee bulletins:

5. Determining Soil Types on Tennessee Farms

6. Getting Acquainted with the Origin and Nature of Farm Soils in Tennessee

In addition to the Tennessee publications the following were used: A Handbook of Agronomy, Bulletin 97, Virginia Agricultural and Mechanical College and Polytechnic Institute; and Kudzu, A Forage Crop for the Southeast, Leaflet 91, United States Department of Agriculture.

ESTIMATED YIELDS

Estimated yields of crops under two levels of management for the soils of the county are given in table 6. This table compares yields of different soils of the area under similar levels of management or of the same soils under different levels of management. It shows the crop responses that can be expected from improved management on given soils.

In columns A the yields given are those expected under the present prevailing practices of soil management. These practices are not the same on all soils, nor are they the same for any given soil in different parts of the area or on different farms, but it is believed that the practices described in the section on Soils under the individual soil descriptions and in the subsection, Soil Use and Management, are representative of current management practices. These yields are based largely on observations made by members of the soil survey party, on information obtained by interviews with farmers and other agricultural workers who have had experience with the soils and crops of the area, and on comparisons with yield tables for similar soils in other counties of Tennessee. Specific crop yield data by soil types are not generally available, but the summation of local experience gives fairly reliable estimates of the yields that can be expected under the management commonly practiced. For some crops, yield information of any kind is scarce. This is especially true of sorghum and of the carrying capacity of pastures.

In columns B the yields given are those that represent the expected yields of crops under good management. Good management refers to the proper choice and rotation of crops; the correct use of commercial fertilizer, lime, and manure; proper tillage methods; the return of organic matter to the soil; mechanical means of water control used to maintain the productivity or to increase it within practicable limits; the improvement of workability; and the conservation of soil material, plant nutrients, and soil moisture.

Present knowledge of the requirements for good management of specific soils for specific crops is limited, but some of the deficiencies of the soils are known with some certainty, and the probability of other deficiencies is fairly well established. Factors that may determine in part the level of good management for the soils on a particular farm include the proportionate acreage and distribution of the various soils on the farm, the combination of industries in the farm business, location of the farm relative to markets and other facilities, prices, size of the farm, and several other factors.

Inasmuch as good management cannot be rigidly defined and because information about crop yields under conditions that may approach

TABLE 6.—Benton County, Tenn., soils: Average acre yields¹ that may be expected prevailing management and (B) good management

Soil	Corn		Cotton		Peanuts		Lespedeza hay		Soybean hay		Red
	A	B	A	B	A	B	A	B	A	B	A
Almo silt loam.....	Fu (¹)	20	Lb. (¹)	Lb. (¹)	Lb. (¹)	Lb. (¹)	Tons (¹)	Tons (¹)	Tons (¹)	Tons (¹)	Tons (¹)
Alva fine sandy loam.....	(¹)	30	45	280	800	900	0.4	1.0	0.8	1.0	1.0
Beechy silt loam.....	(¹)	45	(¹)	(¹)	(¹)	(¹)	1.4	1.6	1.4	1.7	1.7
Beechy fine sandy loam.....	(¹)	25	(¹)	(¹)	(¹)	(¹)	.4	1.2	.9	1.3	1.3
Bodine cherty silt loam.....	(¹)	20	(¹)	(¹)	(¹)	(¹)	.3	1.0	.8	1.2	1.2
Hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Severely eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Steep phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Briensburg silt loam.....	(¹)	20	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Bruno loamy fine sand.....	10	35	100	160	100	500	.4	.8	.5	.8	.8
Cuthbert fine sandy loam.....	25	35	240	380	(¹)	(¹)	1.1	1.2	1.1	1.5	1.5
Cuthbert clay loam.....	18	2 ²	(¹)	(¹)	500	600	.4	.7	.7	1.0	1.0
Eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Severely eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Cuthbert, fine sandy loam.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Steep phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Dexter silt loam.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Eroded undulating phase.....	25	40	320	480	750	900	1.2	1.8	1.0	1.6	1.6
Eroded rolling phase.....	22	35	280	420	600	800	1.0	1.6	.9	1.4	1.4
Dickson silt loam.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Undulating phase.....	20	35	260	440	750	900	.9	1.5	.7	1.5	1.5
Eroded undulating phase.....	18	30	240	400	600	800	.8	1.4	.6	1.3	1.3
Rolling phase.....	18	30	240	400	650	850	.8	1.4	.7	1.4	1.4
Eroded rolling phase.....	16	25	220	380	400	500	.7	1.2	.5	1.0	1.0
Dickson silty clay loam, severely eroded rolling phase.....	(¹)	15	(¹)	120	(¹)	(¹)	.3	.6	(¹)	(¹)	(¹)
Duac silt loam.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Undulating phase.....	20	35	260	440	750	900	.9	1.5	.7	1.5	1.5
Eroded undulating phase.....	18	30	240	400	600	800	.8	1.4	.6	1.3	1.3
Rolling phase.....	18	30	240	400	650	750	.8	1.4	.7	1.4	1.4
Eroded rolling phase.....	16	25	220	380	400	500	.7	1.2	.5	1.0	1.0
Duac silty clay loam, severely eroded rolling phase.....	(¹)	15	(¹)	120	(¹)	(¹)	.3	.6	(¹)	(¹)	(¹)
Egan silty clay loam.....	(¹)	25	(¹)	(¹)	(¹)	(¹)	.3	1.5	(¹)	1.4	2.0
Ennis silt loam.....	35	50	(¹)	(¹)	800	1,000	1.4	1.6	1.5	2.0	2.0
Ennis cherty silt loam.....	18	25	(¹)	(¹)	600	700	.8	1.4	1.0	1.5	1.5

22	30	240	380	(¹)	(¹)	1.0	1.1	1.0	1.4	(¹)
20	35	260	440	760	900	.9	1.5	.7	1.5	.7
18	30	240	400	600	800	.8	1.4	.6	1.3	.6
18	30	240	400	650	850	.7	1.4	.7	1.4	.6
16	25	220	380	400	500	.7	1.2	.5	1.0	.4
(¹)	16	(¹)	120	(¹)	(¹)	.3	.6	(¹)	(¹)	(¹)
25	35	(¹)	(¹)	700	800	1.1	1.3	1.0	1.5	.8
20	30	(¹)	(¹)	500	700	.9	1.1	.8	1.2	.6
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	.6	1.2	.8	1.5	(¹)
12	20	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	1.2	1.6	1.2	1.8	1.0
30	45	280	420	900	1,200	.7	1.0	.9	1.5	.8
18	25	220	360	700	900	1.8	1.9	1.9	2.2	(¹)
45	55	(¹)	(¹)	(¹)	(¹)	1.2	1.4	1.2	1.7	(¹)
25	35	200	320	(¹)	(¹)	1.1	1.3	1.2	1.6	(¹)
22	30	200	320	(¹)	(¹)	.7	1.3	.6	1.3	.5
16	25	220	360	600	700	.6	1.0	.8	1.0	(¹)
14	20	200	340	400	500	.7	1.3	.6	1.3	(¹)
16	25	220	360	600	700	.3	.5	(¹)	(¹)	(¹)
(¹)	12	(¹)	100	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	1.3	1.5	1.5	2.0	(¹)
25	35	(¹)	(¹)	(¹)	(¹)	.9	1.0	1.3	1.8	(¹)
20	30	(¹)	(¹)	(¹)	(¹)	.8	1.0	1.2	1.6	(¹)
20	30	(¹)	(¹)	(¹)	(¹)	.4	1.0	1.0	1.5	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	.7	1.2	.8	1.2	.4
16	25	220	380	500	600	.6	1.0	.5	1.0	(¹)
14	20	200	320	400	500	(¹)	(¹)	(¹)	(¹)	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
20	35	260	440	750	900	.9	1.5	.7	1.5	.7
16	25	220	380	400	500	.7	1.2	.5	1.0	.4

See footnotes at end of table.

TABLE 6.—Benton County, Tenn., soils: Average acre yields¹ that may be expected—Continued

Soil	Corn		Cotton		Peanuts		Lespedeza hay		Soybean hay		Red
	A	B	A	B	A	B	A	B	A	B	A
Providence silt loam:											
Undulating phase.....	Ru. 20	Fu. 35	Lb. 260	Lb. 440	Lb. 750	Lb. 900	Tons .9	Tons 1.5	Tons .7	Tons 1.5	Tons .7
Eroded undulating phase.....	18	30	240	400	600	800	.8	1.4	.6	1.3	.5
Rolling phase.....	18	30	240	400	650	850	.7	1.4	.7	1.4	6
Eroded rolling phase.....	16	25	220	380	400	500	.7	1.2	.5	1.0	.4
Providence silty clay loam,											
severely eroded rolling phase.....	(¹)	15	(¹)	120	(¹)	(¹)	.3	.6	(¹)	(¹)	(¹)
Robertsville silt loam.....	(¹)	20	(¹)	(¹)	(¹)	(¹)	.4	1.0	.8	1.0	(¹)
Rough gullied land:											
Cuthbert soil material.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Ruston soil material.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Ruston fine sandy loam:											
Hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Steep phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Ruston sandy clay loam, severely											
eroded hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Safford clay loam:											
Eroded rolling phase.....	(¹)	(¹)	200	(¹)	(¹)	(¹)	(¹)	1.2	(¹)	(¹)	(¹)
Severely eroded hilly phase.....	18	30	(¹)	320	(¹)	(¹)	.9	(¹)	.8	1.2	(¹)
Safford very fine sandy loam:											
Hilly phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Steep phase.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Rolling phase.....	22	35	220	380	(¹)	(¹)	1.1	1.4	1.0	1.4	.6
Savannah very fine sandy loam:											
Rolling phase.....	18	30	240	400	650	850	.8	1.4	.7	1.4	.6
Eroded rolling phase.....	16	25	220	380	400	500	.7	1.2	.5	1.0	.4
Savannah clay loam, severely											
eroded rolling phase.....	(¹)	15	(¹)	120	(¹)	(¹)	.3	.6	(¹)	(¹)	(¹)
Sequatchie fine sandy loam.....	30	45	350	620	900	1,200	1.2	1.4	1.2	1.8	1.2
Shannon silt loam.....	35	50	280	480	700	900	1.4	1.6	1.5	1.8	.8
Shannon fine sandy loam.....	30	45	250	420	800	900	1.3	1.5	1.4	1.7	.9
Shubuta fine sandy loam, rolling											
phase.....	14	20	140	200	(¹)	(¹)	.4	.6	.4	.6	(¹)
Taft silt loam.....	15	25	(¹)	(¹)	(¹)	(¹)	.7	1.4	.8	1.5	(¹)

Tippah silt loam, eroding rolling phase.....
 Wofford silt loam.....
 Wofford silty clay loam, eroded phase.....

16	22	220	340	400	500	.7	1.0	.5	.9
25	35	280	450	700	900	1.0	1.5	.8	1.5
18	30	240	400	600	800	.8	1.2	.6	1.3

¹ Good average acre yields in the better areas of commercial production in the United States are: Corn, 50 bushels; cotton, tons; soybean hay, 2.5 tons; red clover, 2 tons; sorghum, 100 gallons; pasture, 100 cow-acre days. For example, Almo silt loam, y as the soils in the United States on which corn is the principal commercial crop.
² Cow-acre-days, used to express the carrying capacity of pasture land, is the product of the number of animal units carried year the animals can be grazed without injury to pasture, for example, a soil that supports 1 animal unit per acre for 360 days r 180 days rates 60, and a soil supporting 1 animal unit on 4 acres for 100 days rates 25.
³ The soils are grouped according to their relative physical suitability for the general agriculture of the area.
⁴ Crop not commonly grown; soil physically unsuitable for its production under management specified.
⁵ Crop not commonly grown; soil suitable although less so than for crops for which ratings are given.

good management is scarce, the expected yields in columns B are based largely on estimates of men who have had experience with the soils and crops. These estimates have taken into consideration the known deficiencies of the soil and the increases in crop yields that can be expected when the deficiencies are corrected within practicable limits. These limits cannot be precisely defined, nor can the response of a given crop on a given soil to the improved management practices be precisely predicted. Some unknown deficiency that is not being corrected may materially affect yields. The yields listed in columns B give some idea of the responses that can be expected from good management, as compared with the ordinary or common management (columns A). There are practically no soils in Benton County on which more intensive management will not bring profitable increases in yields.

WATER CONTROL ON THE LAND

Water control on the land consists of practices having to do with the maintenance of favorable soil moisture conditions and the regulation of runoff. These practices can be grouped as follows: (1) Control of runoff, (2) protection from flooding, (3) drainage, and (4) irrigation. The control of runoff is probably the most important as a farm problem, although artificial drainage is also significant. Much has been done for flood control along the Tennessee River and some of its larger tributaries but the individual farms are doing very little in the way of engineering practices. Very few if any of the farmers in Benton County now practice supplementary irrigation. Progress reports on experimental work indicate that irrigation offers good possibilities.

CONTROL OF RUNOFF

Soil erosion occurs as normal or accelerated. Normal erosion is characteristic of the land in its natural environment, undisturbed by human activity, as under the protective cover of the native vegetation. Accelerated erosion refers to erosion of the soil or rock over and above normal erosion brought about by changes in the natural cover or ground conditions and includes changes caused by human activity and those caused by lightning and rodent invasion (9). As water is the only active natural agent of soil erosion in the county, erosion, as used hereafter in this section, refers to accelerated erosion by water.

The farmers' problem is more correctly that of the proper use, conservation, and control of water on the fields, pastures, and woodland where it falls. Proper use and control of water is inseparable from soil conservation. Such water control brings about a number of desirable effects—the checking of erosion; a more adequate and uniform supply of moisture for growing crops; improved tillage conditions or working properties of the soil, particularly during periods of low rainfall; better conditions for biological activity; and improved conditions for the formation and conservation of humus. These desirable effects in turn facilitate further conservation and control of water.

Since the first permanent settlements were made in the county about 1820 many of the areas suitable for cultivation have been cleared more than 100 years. During this time erosion has been active. The mean

annual rainfall is about 51 inches, and the prevailing relief of the soils of the uplands is undulating to hilly.

Soil erosion in the county is not an isolated problem and cannot be treated or dealt with as such. It is a conspicuous symptom of more deeply seated disorder in soil use and management.⁵ Failure to control water on the land and consequent soil erosion have resulted from the failure to adjust soil use and soil management to the physical capability and character of the soils. That such adjustments have not been complete is evidenced by the conspicuous symptom of erosion. Since loss of water and soil by erosion has resulted from such maladjustments, the remedy is to be sought through corrective redirection of soil use and management.

Since the use and management of the soils should be adjusted to the physical capability and character of the soils, such adjustment cannot be effected rapidly on all farms under existing conditions. On some farms the physical use capability and management requirements are in conflict with immediate need for cash income for paying debts and for family living expenses. Compromises are not only expedient but inevitable on many such farms. Readjustments of soil use and management to effect better water control and thus check erosion are complicated undertakings, and thorough familiarity with all factors involved is essential.

Forest trees and close-growing grasses and legumes are among the most effective means of controlling runoff and preventing erosion. Forests function in several ways. The forest canopy interrupts the fall of the water and breaks the force of its impact on the land surface. Forest mold and litter further breaks the impact and absorbs large quantities of water. It also adds large quantities of organic matter to the soil and thus greatly increases its water-holding capacity as do also the channels left by decayed roots and the burrows of insects, earthworms, and other organisms. The tree rootlets serve as a binding agent in the soil. To be most effective forests should be protected from fire and livestock grazing. The destruction of the forest litter is thereby prevented, and this is most important from the standpoint of runoff control. In this county reforestation should be considered as a means of preventing further soil erosion for all the cleared Fifth-class soils.

Grasses and close-growing legumes are effective in much the same way as forests in preventing excessive runoff. They break the force of the rainfall, catch and hold soil particles, increase the content of organic matter and the water-holding capacity of the soil, and bind the soil mass with their roots. They can be used successfully, however, only on soils that are less strongly sloping and on those that are at least moderately fertile. These close-growing plants can be used to good advantage as permanent cover on all of the sloping and hilly upland soils rated as Fourth-class and in the rotation used on most of the croplands. Slope, present degree of erosion, natural fertility, and specific

⁵ The terms "soil use" and "soil management," as used here, refer to the use and management of soils for the production of plants only. Soil use refers to broad classes of use such as intertilled or clean-cultivated crops, close-growing crops (small grains, grasses, and legumes), permanent pasture, and forest. Soil management includes such practices as the choice and rotation of crops, tillage practices, green manuring, liming, fertilization, and mechanical measures for water control.

needs of a particular farm should be considered in determining the frequency and length of time sod crops should remain on the soil.

Lime, although used chiefly for neutralizing soil acidity, functions both directly and indirectly in controlling runoff. Lime applied to acid soils, especially the heavier textured ones, tends to coagulate or flocculate the fine soil particles into larger crumbs or granules that are less easily moved by water and at the same time tends to increase the pore space and water-holding capacity of the soil. It functions indirectly by neutralizing soil acidity and by increasing the availability of phosphorus, potash, and other plant nutrients, thereby increasing the vigor of plant growth and improving conditions for bacterial activity so that the humus content and water-holding capacity of the soils are increased. Mineral fertilizers function in a similar manner by stimulating plant growth and microbiological activity, whereas barnyard manure is a direct means of increasing the humus supply and the water-holding properties of the soil. All these materials should be effective in varying degrees in helping to control runoff on all of the upland pasture and crop soils.

On cropland, proper selection and rotation of crops are effective in preventing erosion and conserving soil moisture. On rolling and strongly rolling soils of the uplands and stream terraces, close-growing small grains, grasses, and legumes should be grown as much of the time as is practical from the standpoint of good farm management. Plans should be laid so as to leave the soils bare of vegetation as little as possible and to provide a cover of some close-growing crop during fall and winter. Cover crops and green-manure crops should be included in the rotation as a means of maintaining or increasing the supplies of humus and nitrogen. Both tilth and the moisture-holding capacity of the soil are improved by plowed-under cover crops and green-manure crops.

Strip cropping is effective in preventing erosion in many places. In this system close-growing small grain and hay crops and clean-cultivated crops are grown on alternate long narrow strips approximately on the contour. The close-growing crops serve to slow the velocity of runoff waters so that soil material washed from the clean-cultivated strips is dropped and the cutting power of the water is decreased. Furthermore, if properly planned, greater efficiency in using farm machinery, building fences, and in other farm operations is attained. Strip cropping can be used most effectively on soils that are on long, rolling, or strongly rolling slopes of the uplands and old terrace lands.

All the means of runoff control described above are concerned chiefly, either directly or indirectly, with vegetative cover. In many places it is necessary to use engineering measures, as diversion ditches, terraces, dams, and contour furrows, either by themselves or in conjunction with the practices previously discussed, to completely control runoff.

Terraces are likely the most common and in many places the most effective of the mechanical devices used for runoff control. A terrace is essentially an earth ridge with a channel above. It is placed approximately on the contour of a slope, and it intercepts and stores or diverts water that falls on the land so as to reduce soil erosion and loss of soil moisture. To be effective, terraces must be properly con-

structed, have proper outlets, and be properly maintained. Under conditions in this county, it is doubtful whether terraces can be used to advantage on slopes of more than 15 percent, or on severely eroded soils, or on soils with naturally thin surface soils. Terraces must be carefully laid out and maintained to be effective on soils having well-developed silt pans. They are not generally suited to hilly or steep soils.

Contour furrows is another practice for checking runoff. Furrows or small ridges constructed across the slope on the contour act as impounding basins to promote further moisture absorption. These furrows may be used by themselves or in connection with a system of terraces. In recent years machines have been devised that seed small grains, grasses, and legumes and throw up the furrow in one operation. This method of runoff control is suited chiefly to use on rolling or hilly pasture lands.

Various types of permanent and temporary dams are among the mechanical devices used in stabilizing the flow of water in natural channels and gullies. Permanent dams are constructed of concrete reinforced with steel and of rock and concrete. Paved waterways and channels of similar materials may be needed in certain critical positions. Temporary dams are constructed of brush, wire, logs, straw, and loose rock in various combinations. Such dams are used primarily to stabilize gullies or other channels so that vegetation, either grasses or trees, may be established. As with other engineering structures, dams must be correctly planned and carefully constructed to be effective. Careful consideration of the cost of dams, as compared to their effectiveness, is necessary in order to determine their economic value and feasibility.

Although these measures for runoff control are discussed separately, the application of one of the control measures by itself can be effective in very few places. On most areas, some combination of measures will be required. Runoff control is a part of farm management, and it is one of the many results of well-adjusted soil use and management.

DRAINAGE

As compared with the problem of runoff control, the problem of drainage is less important in this county but is nevertheless significant. The imperfectly drained soils—the Lobelville, Lindsides, Hymon, Briensburg, Hatchie, and Taft—are ordinarily sufficiently well drained for the production of summer annuals, as corn, and of winter annuals, biennials, and perennials that are moderately tolerant of high-moisture conditions at least part of the time. On the other hand the poorly drained soils—the Melvin, Beechy, Robertsville, and Almo—are generally too wet for crops requiring tillage.

Artificial drainage of the imperfectly drained soils would broaden their adaptability and increase their productivity of crops now grown. The Lobelville, Lindsides, and Hymon soils, which are on stream bottom lands, and the Briensburg soils, which are on colluvial lands, are friable and permeable and would be expected to drain well, either by tiling or ditching, if such drainage were otherwise feasible. Improving the drainage of Taft and Hatchie soils would be more difficult because of the silt pan or clay pan, and also because suitable outlets are not available for many areas.

Artificial drainage of the poorly drained soils now unsuitable for field crops would presumably make them suitable for such crops and also improve their productivity of pasture. The permeable Melvin and Beechy soils would be expected to drain well, if artificial drainage were otherwise feasible. Drainage of the Robertsville and Almo soils would be difficult, chiefly because of the claypans or siltpans and the lack of outlets, as they usually occupy shallow depressions of extensive flat areas. The Robertsville and Almo soils are also low in fertility and strongly to very strongly acid; probably they would not be highly productive, even if drained. The Melvin and Beechy soils, on the other hand, are generally more favorable in regard to fertility and reaction and would be expected to become moderately to highly productive if drained.

The Lobelville, Lindside, Hymon, Melvin, and Beechy soils, which are in the stream bottom lands, are subject to flooding. Although artificial drainage might reduce the frequency and shorten the duration of such floods, it would not prevent crop injury from flooding. Engineering measures, as building dikes for the protection of the soils in the bottoms against flooding, are uncommon.

The problem of water control, including artificial drainage as well as runoff control, is a problem of farm management. The feasibility of effective water-control measures depends on many factors other than the soils themselves, and some of these factors are beyond the immediate control of the individual farmers.

INTERPRETIVE MAPS

A large number of interpretive maps, showing land classes, drainage, soil associations, slope classes, and stoniness, can be derived from the detailed soil map.

SOIL ASSOCIATIONS

Not only do the soils occur in characteristic positions in the landscape, but they also occur in rather distinguished geographic associations. The Hatchie soil of the high terraces, for example, is nearly always associated with the Freeland and Almo soils. Likewise, the Huntington soils of the stream bottoms are generally associated with Lindside soils of the bottoms and with Wolftever soils of the low terraces. By placing geographically associated soils in groups, it is possible to prepare a generalized map showing the areas dominated by each group of such associated soils. On this basis, the soils of the county have been placed in eight groups, called soil associations, which have fairly well-defined geographic boundaries. Figure 4 shows the geographic distribution of the various soil associations.

A soil association can be defined as a group of soils occurring together in a characteristic pattern. A soil association may consist of only a few soils, or of many; the soils may be similar or they may represent many differing types. In each association there is a certain uniformity of soil pattern, but this does not necessarily mean that the soils are similar in their use suitability.

The other soils with which a particular soil is associated have a great influence on its use suitability. A soil physically suitable for corn, for

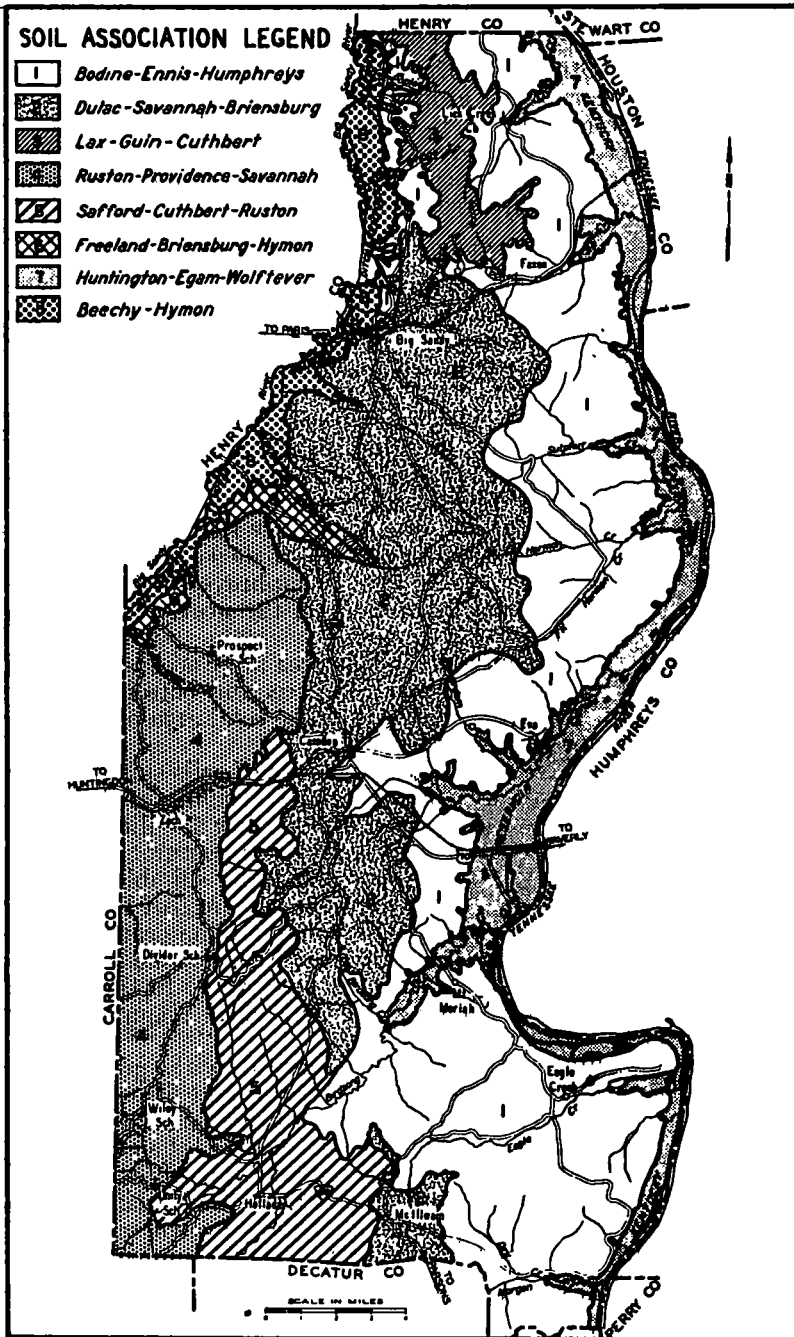


FIGURE 4.—Soil association map of Benton County, Tenn.

example, may be associated with other soils also physically suitable for such use, or it may be associated with other soils poorly suited to corn production. Other soils often determine how frequently a given soil is cropped to corn, what crops the corn is rotated with, and how intensively it is cropped. It is important, therefore, to know the characteristics not only of a given soil but also the characteristics of the soils with which it is associated. Illustrations and descriptions follow for each of the eight associations.

BODINE-ENNIS-HUMPHREYS ASSOCIATION

In the Bodine-Ennis-Humphreys association, the Bodine soils are the most extensive but the Ennis and Humphreys are more important agriculturally. Other inextensive soils important to the agriculture of the area are members of the Dickson, Greendale, Lobelville, and Melvin series.

The soils of the Bodine-Ennis-Humphreys association occupy about 31 percent of the county in the highly dissected parts of the cherty limestone hill section. The topography is characterized by narrow winding ridges and deep steep-walled V-shaped valleys. Typical areas have Dickson soils on the broader gently sloping ridge crests; steep Bodine soils on the ridge slopes; Greendale soils on the sloping alluvial-colluvial fans; gently sloping Humphreys soils on the low narrow stream terraces; and Ennis soil on the nearly level narrow stream bottoms (pl. 7).

Most of the soils of the uplands in this area are Fourth- and Fifth-class soils, but those of the colluvial, terrace, and bottom lands are predominantly First- and Second-class. The total area of the First- and Second-class soils is comparatively small.

Although the area is large, the total acreage of soils suited to crops is small. The upland soils are predominantly members of the Bodine series, and owing to steepness, chertiness, and low fertility, they are unsuited, or at least very poorly suited, to crops or pasture. The Dickson soils of the broader ridge crests are physically suitable for crops, but they are more or less isolated by the extensive areas of Fourth- and Fifth-class Bodine soils. Consequently, most of the crops and pastures are on Ennis, Humphreys, and Greendale soils of the bottom, terrace, and colluvial lands. These soils are moderately fertile and productive but in many places contain sufficient chert fragments to interfere materially with cultivation.

The type of farming in this area is influenced by the adjacent bottom-land areas (Huntington-Egam-Wolftever and Beechy-Hymon associations) in that the corn-and-hog type of farming is followed on the creek-bottom soils, with little use being made of the adjacent upland soils. About 38 percent of the cleared land is used for row crops. Corn alone is grown on about 28 percent of the cleared land. Small acreages of peanuts, cotton, and sorghum are grown on the self-sufficing farms that characterize this area.*

DULAC-SAVANNAH-BRIENSBURG ASSOCIATION

The Dulac-Savannah-Briensburg association, which includes about 25 percent of the county, is on the undulating to rolling loess plain

* Tennessee College of Agriculture Extension Service. AN AGRICULTURAL STUDY OF BENTON COUNTY, TENN. 1940. [Unpublished.]

in the central part of the county (pl. 6, *B*). Typically, Dulac soils are on the gently sloping and the Savannah on the gently sloping to sloping areas of the uplands, Briensburg on the colluvial lands, and Hymon soils on the bottom lands (pl. 8). Less extensive soils are members of the Tippah, Cuthbert, Safford, Beechy, and Shannon series.

Most of the soils of this area are suitable for crops. Second-class soils predominate, but Third- and Fourth-class soils are of significant extent. Erosion has significantly injured many of the upland soils. The Dulac and Savannah soils are well suited to crops but are low in fertility. The Hymon and Briensburg soils are imperfectly drained and consequently somewhat limited in crop adaptation, especially the Hymon that are also subject to periodic overflow.

The Dulac-Savannah-Briensburg association is characterized by small general-type farms. Cotton is the only important cash crop. The percentage of cleared land in corn is less than in other associations. Red clover, sericea lespedeza, and crimson clover have been grown successfully on small areas but are not generally grown. Cattle are the source of almost one-third of the total income from livestock. The income from hogs ranks second to cattle; poultry, dairy products, and colts follow in order named. The agriculture is more diversified in this than in all the other areas except the Freeland-Briensburg-Hymon association.

LAX-GUIN-CUTHBERT ASSOCIATION

The small area comprising the Lax-Guin-Cuthbert association is on high uplands in the northern part of the county. It covers only 4 percent of the total county area. Lax soils are on the undulating to rolling broad ridge crests and Guin on the steep ridge slopes and the narrow ridge crests (pl. 9). A small acreage of Cuthbert, Bodine, and Briensburg soils are included in this association.

The association is characterized by poor soils and a low percentage of cleared land. Only about 14 percent of the area is cleared. The Lax soils, the principal ones used for crops, are physically suitable for crops, but they are naturally low in fertility and are highly susceptible to erosion. Moisture relations are poor, and crops suffer severely from droughts. The Guin soils are not suitable for crops or pasture, because of low fertility, steepness, and high gravel content. Fifth-class soils predominate in the association, but those used for crops are chiefly Third-class.

The association is characterized by a subsistence type of farming, with cotton as the only cash crop. Hogs are the source of almost two-thirds of the livestock income, and poultry and veal calves account for the rest.

RUSTON-PROVIDENCE-SAVANNAH ASSOCIATION

The Ruston-Providence-Savannah association covers 16 percent of the county in the highly dissected sandy Coastal Plain section in the western part of the county. The topography of the area is characterized by short steep slopes, narrow V-shaped valleys, and relatively broad flat flood plains along the major streams (pl. 6, *C*). Typically, Providence soils are on the broader ridge crests, Savannah soils on the narrow ridge crests, Ruston soils on the steep ridge slopes, Briensburg soils on the sloping colluvial land, and Beechy soils on the bottom lands (pl. 10).

The soils, in general, are poorly suited to crops or pasture. The Ruston soils are the most extensive, but owing to steepness, erodibility, and low fertility, they are not suitable for crops. Cleared areas have been severely injured by erosion in most places. The Providence and Savannah soils are physically suitable for crops, but like the Ruston, they have been severely injured by erosion. The Beechy soils of the bottom lands are poorly drained and generally suitable for crops but are fairly well suited to pasture. Most of the corn is produced on Beechy soil, although the crop is frequently damaged by extended wet seasons.

A subsistence type farming is practiced in this area. Cotton is the only important cash crop, although some corn and hay are sold. The sale of veal calves from the family milk cow is the chief source of livestock income. Hogs, dairy products, and sheep rank in importance in the order named. This area contains a higher percentage of idle or abandoned open land than any of the others.⁷

SAFFORD-CUTHBERT-RUSTON ASSOCIATION

The Safford-Cuthbert-Ruston association covers 10 percent of the county and has a higher percentage of woodland than any of the other associations. It is highly dissected, and the soils are intricately associated geographically. Members of the Cuthbert, Safford, Ruston, Dulac, Providence, Savannah, Briensburg, Hymon, and Beechy series are in the area. In most places Dulac soils are on the ridge crests, Safford or Cuthbert soils on the ridge slopes, Briensburg soils on the colluvial lands, and Hymon soils on the bottom lands (pl. 11).

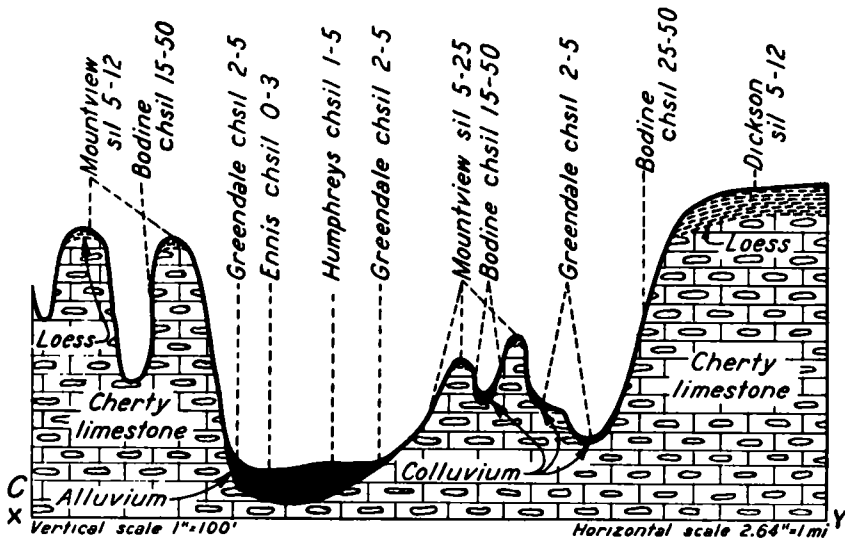
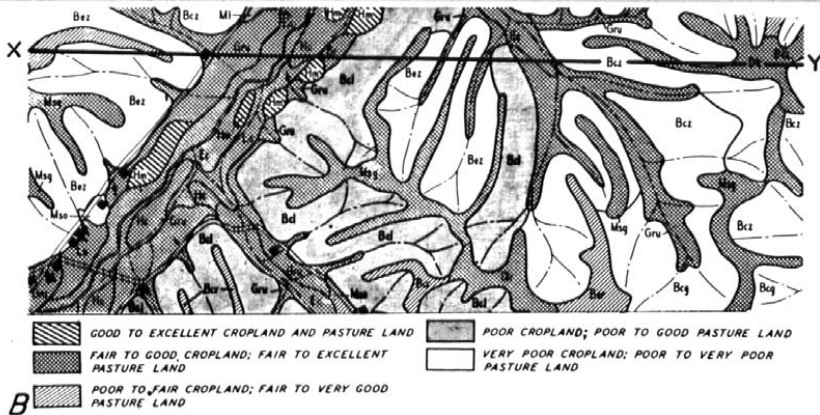
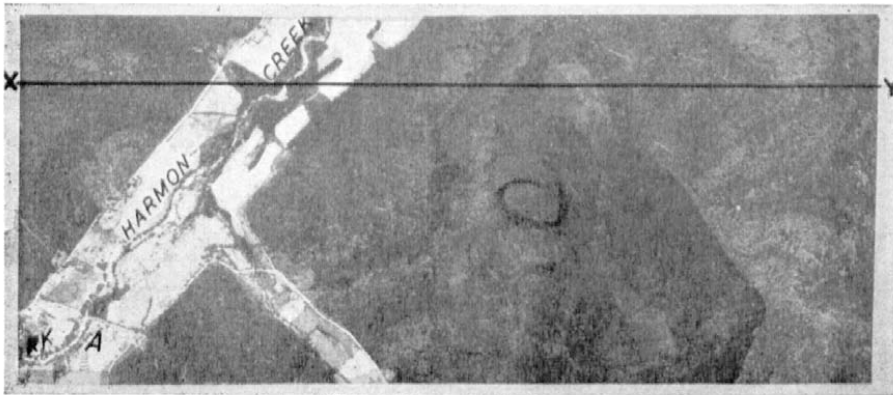
The soils in general are poorly suited to crops. The Dulac soils are physically suited to crops, but they occur on narrow ridge tops in association with Fourth- and Fifth-class soils. The Cuthbert and Safford soils, owing chiefly to steepness and extreme susceptibility to erosion, are physically unsuitable for crops. The Safford soils, however, are excellent timber-producing soils, and there is some indication that they would make good pasture land. The Hymon and Briensburg soils of the bottom and colluvial lands are suitable for crop production, although crop adaptation is limited by imperfect drainage, and in the case of the Hymon soils, by periodic overflow. Fourth- and Fifth-class soils predominate in this area, but most farming is on the Second-class soils of the bottom and colluvial lands.

Most of the farms of this area are of the subsistence type. Cotton, the major cash crop, accounts for about 40 percent of the income. Hogs are the major source of livestock income. Forest products contribute a comparatively large amount to the income of the area.

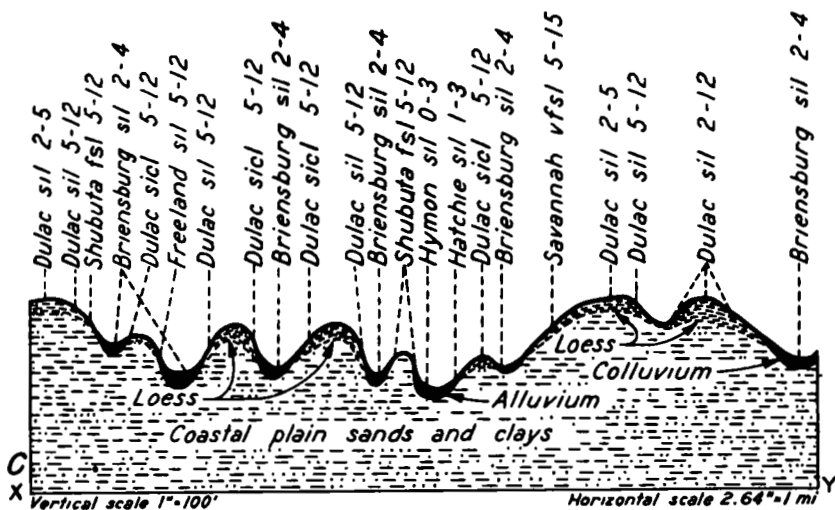
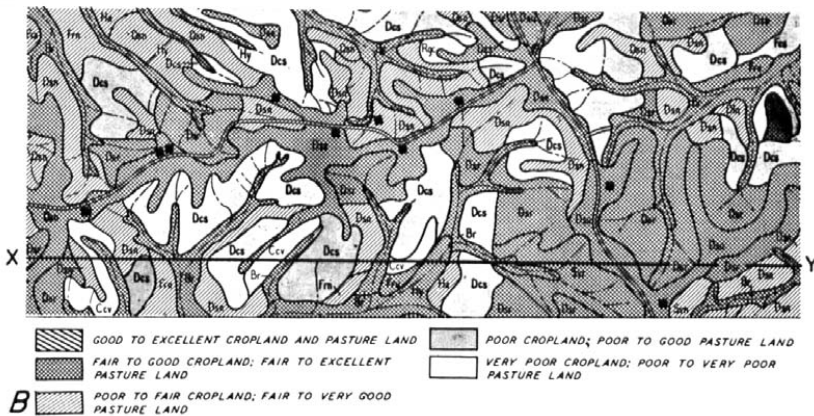
FREELAND-BRIENSBURG-HYMON ASSOCIATION

The small Freeland-Briensburg-Hymon association covers only 1 percent of the county and consists of high terraces along the Big Sandy River. It is weakly dissected and has an undulating to gently rolling topography. Freeland, Briensburg, and Hymon are the most extensive soils, although small areas of Dexter, Hatchie, Almo, Alva, and Beechy soils are included. A typical farm in this area would have Dexter soils on the more strongly sloping areas, Freeland on the undulating to rolling areas, Hatchie on the gently

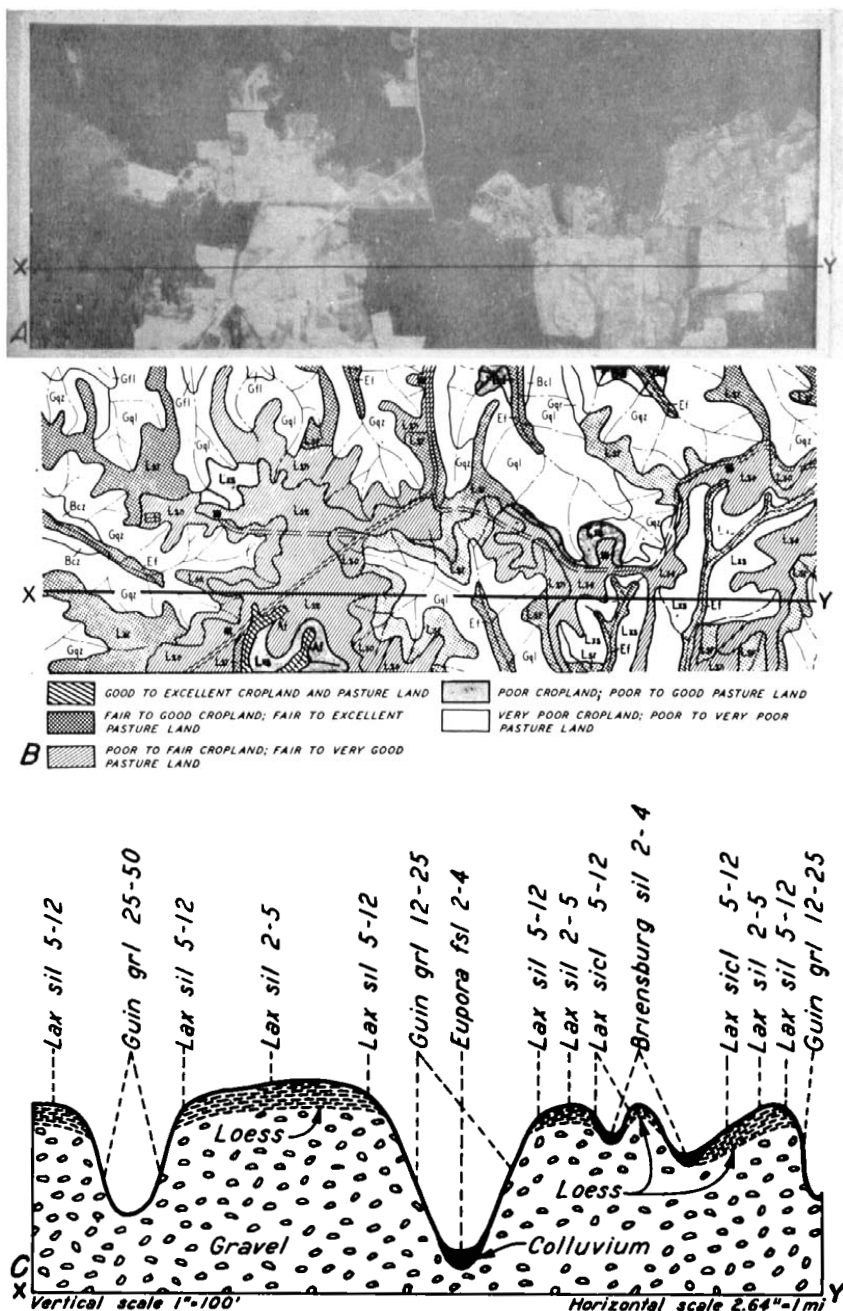
⁷ See footnote 6, p. 142.



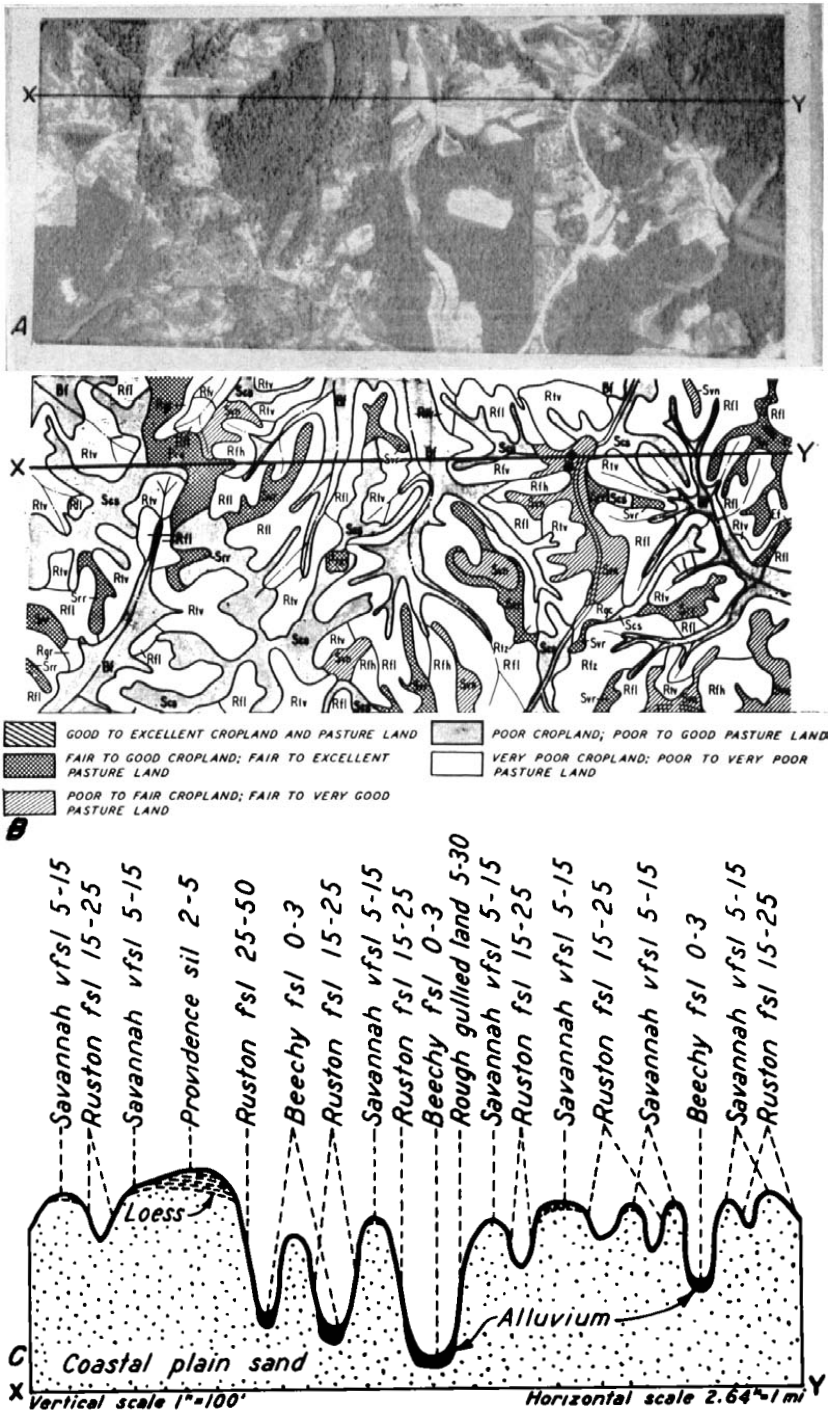
Representative section of the Bodine-Ennis-Humphreys soil association: A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line XY of A and B, showing position of the soils and their relation to parent rock; figures show percent of slope; symbols indicate names of soils as follows: *sil*, silt loam; *chs*, cherty silt loam.



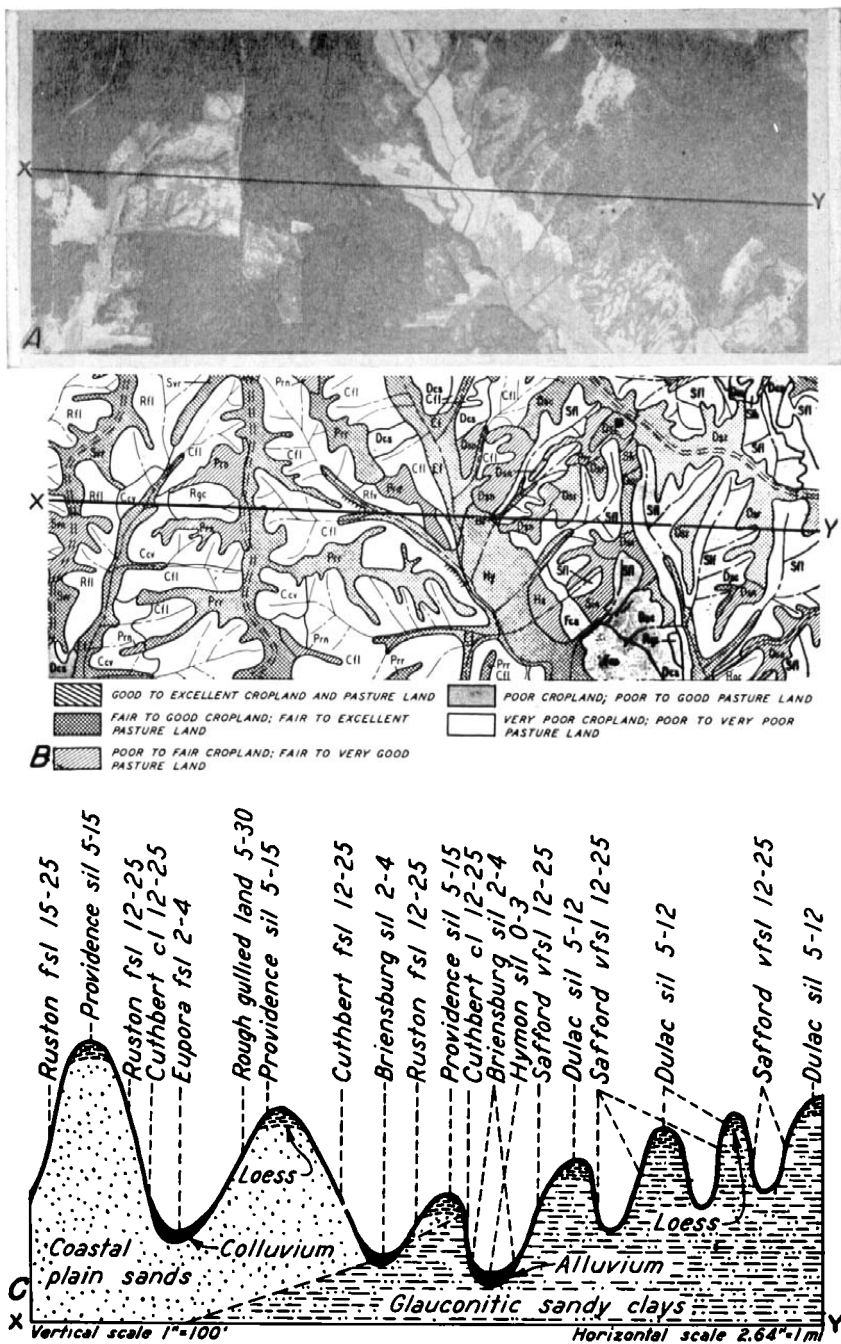
Representative section of the Dulac-Savannah-Briensburg soil association: A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line XY of A and B, showing position of the soils and their relation to parent rock; figures show percent of slope; symbols indicate names of soils as follows: sil, silt loam; fsl, fine sandy loam; sicl, silty clay loam; v fsl, very fine sandy loam.



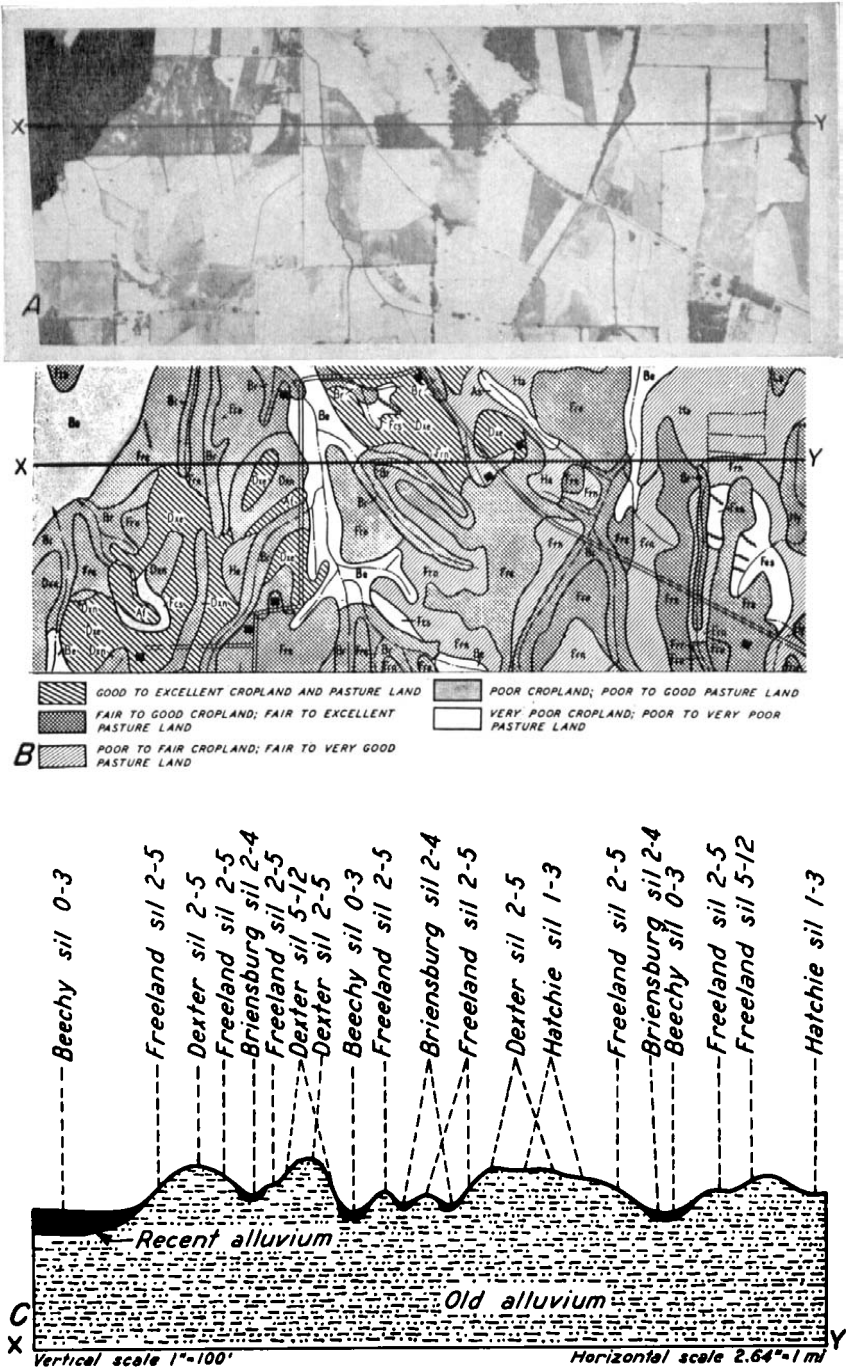
Representative section of the Lax-Guin-Cuthbert soil association: A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line XY of A and B, showing position of the soils and their relation to parent rock; figures show percent of slope; symbols indicate names of soils as follows: *sil*, silt loam; *grl*, gravelly loam; *fsl*, fine sandy loam; *sicl*, silty clay loam.



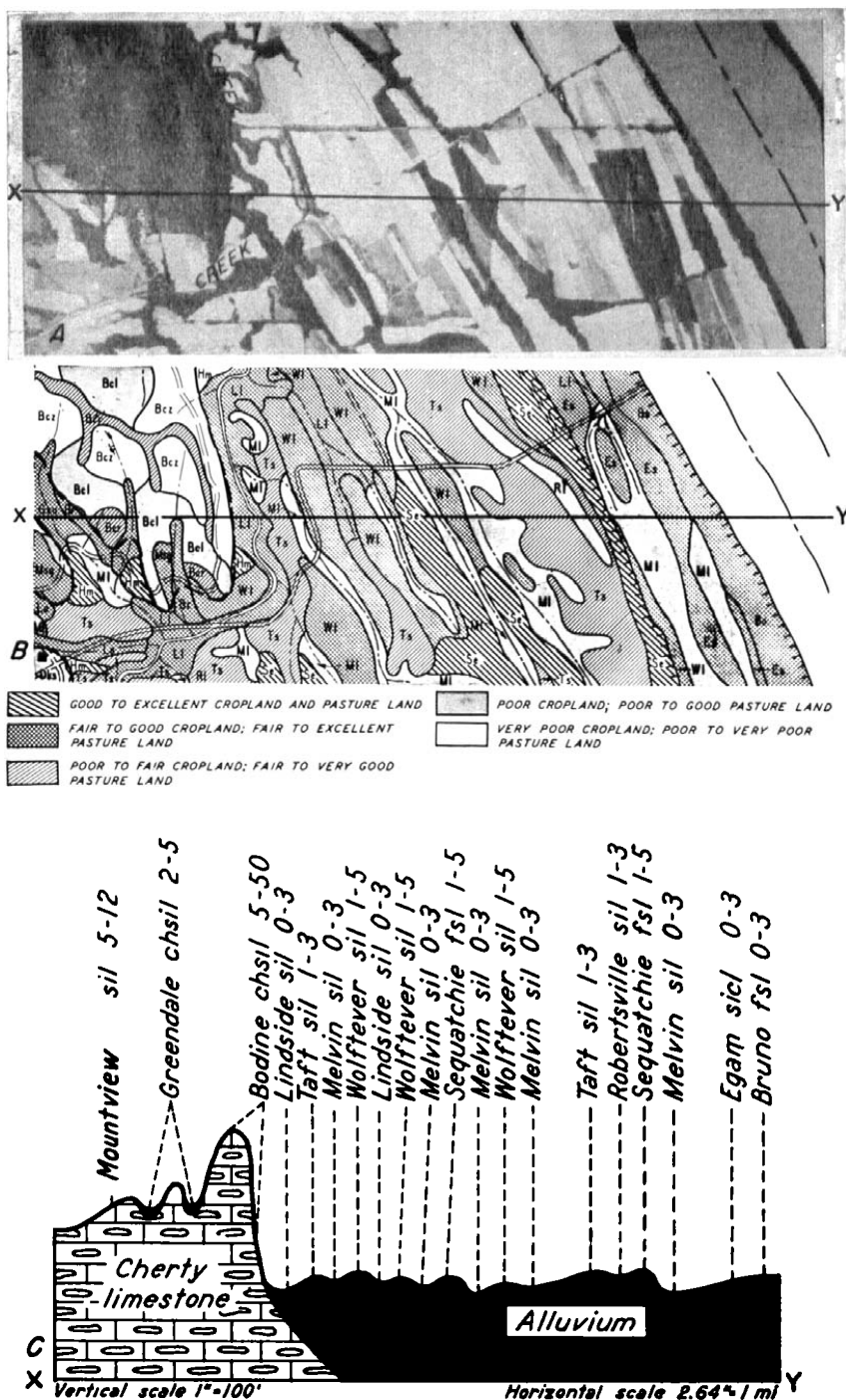
Representative section of the Ruston-Providence-Savannah soil association: A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries, symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line AY of A and B, showing position of the soils and their relation to parent rock, figures show percent of slope; symbols indicate names of soils as follows: vfstl, very fine sandy loam, fsl, fine sandy loam; sil, silt loam.



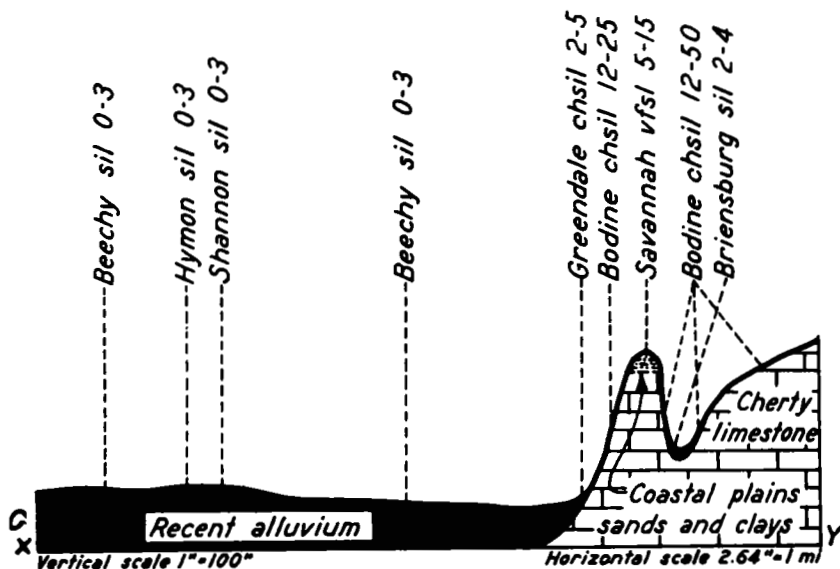
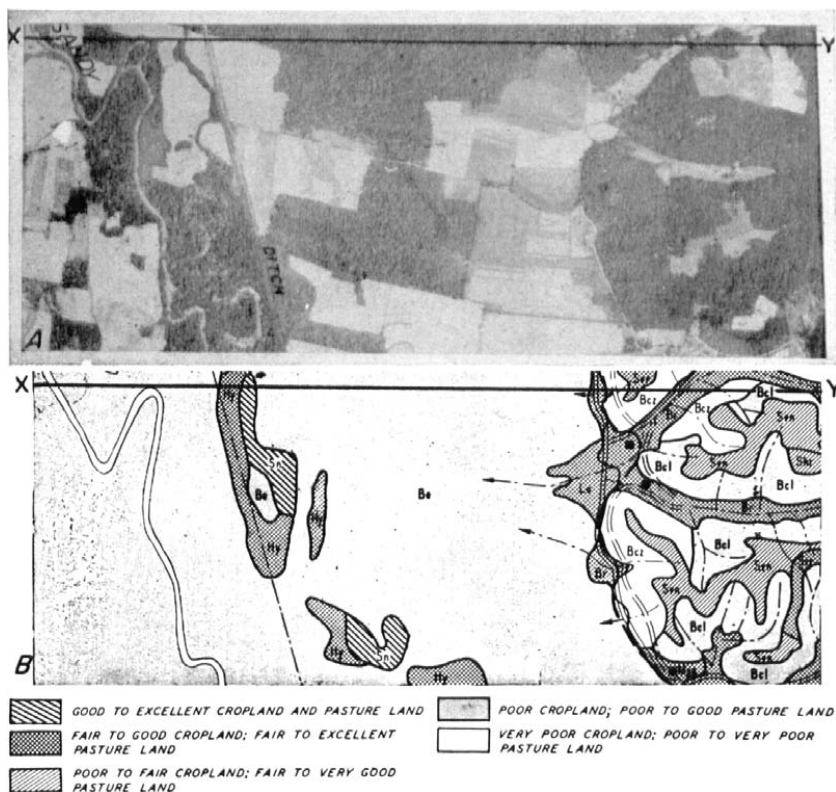
Representative section of the Safford-Cuthbert-Ruston soil association. A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line XY of A and B, showing position of the soils and their relation to parent rock, figures show percent of slope; symbols indicate names of soils as follows: *fsl*, fine sandy loam; *sil*, silt loam; *cl*, clay loam; *vfls*, very fine sandy loam.



Representative section of the Freeland-Briensburg-Hymon soil association: A, Aerial view showing broad land-use patterns. B, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. C, Diagrammatic cross section along line XY of A and B, showing position of the soils and their relation to parent rock; figures show percent of slope; symbol indicates the names of soils as follows sil, silt loam



Representative section of the Huntington-Egam-Wolftever soil association: *A*, Aerial view showing broad land-use patterns. *B*, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. *C*, Diagrammatic cross section along line *XY* of *A* and *B*, showing position of the soils and their relation to parent rock; figures show percent of slope; symbols indicate names of soils as follows. *sil*, silt loam; *chsil*, cherty silt loam; *fsl*, fine sandy loam; *sicl*, silty clay loam



Representative section of the Beechy-Hymon soil association *A*, Aerial view showing broad land-use patterns *B*, Map showing use suitability classes and soil boundaries; symbols are used to simulate a soil map and do not correspond to those on the county soil map. *C*, Diagrammatic cross section along line *XY* of *A* and *B*, showing position of the soils and their relation to parent rock; figures show percent of slope; symbols indicate names of soils as follows: *slt*, silt loam; *chsl*, cherty silt loam; *vsfl*, very fine sandy loam.



- A**, Mutilated areas of siltpan soils, showing how slowly natural vegetation becomes reestablished.
- B**, Mutilated areas formerly covered by Ruston soils are comparatively easy to reforest; pine grows well on the intergully areas; black locust, yellow-poplar, and sweetgum do well on the fill material.

sloping to nearly level areas, Almo on the level to slightly depressional areas, Briensburg on the colluvial land, and Hymon on the bottom land (pl. 12).

The soils of this association are well suited to crops. The use suitability of the Freeland soils, the most extensive in the association, is slightly restricted, and the productivity is moderately low, owing to the restricted drainage and root penetration. The utility of the Hymon and Briensburg soils is limited because of imperfect drainage and susceptibility to overflow. In productivity, however, these soils are comparatively high.

This is a diversified farming area (pl. 4. *B*). Hogs, cattle, poultry, colts, dairy products, and sheep are the source of livestock income, with hogs and cattle supplying over half the total. Corn is grown on the largest acreage, or on about 36 percent of the cleared farm land; but cotton accounts for over 50 percent of the cash income. Corn, hay, sorghum sirup, and cowpea and soybean seed are the source of the rest of the crop income.^a About 66 percent of this area is cleared and used for crops or pasture, and only a very small percentage is idle or in wasteland.

HUNTINGTON-EGAM-WOLFTEVER ASSOCIATION

The Huntington-Egam-Wolftever association includes the first bottoms and low terraces along the Tennessee River. It covers only 10 percent of the total county area. The first bottoms and low terraces are somewhat undulating, consisting of natural levees near the river banks and other low ridges and intervening swales or sloughs that tend to parallel the river. Bruno soil is on the high natural levees, Huntington on the low first bottoms, and Egam on the high bottoms. Lindside and Melvin soils are chiefly in the low swales, Sequatchie and Wolftever on the nearly level to undulating low terraces, and Taft and Robertsville on the level to slightly depressed areas in association with these soils (pl. 13). All this area is subject to periodic overflow, although the low terraces overflow only at long intervals. Most of the area is flooded by the Kentucky Reservoir.

As a group, these are probably the most fertile and productive soils of the county; but owing chiefly to periodic overflow, they are somewhat limited in their use suitability. Also, the crops on Egam and Wolftever soils are very susceptible to drought. The poorly drained Melvin and Robertsville soils are not suitable for crops, but are suitable for pasture.

This association has the highest percentage of cropland of any in the county and is characterized by a corn-hog type of farming. Corn, peanuts, cotton, and hay rank in importance in the order named as a source of crop income. Hogs are by far the most important source of livestock income, supplying over half the total. Cattle, poultry, dairy products, and sheep are the source of the rest of the livestock cash income.

BEECHY-HYMON ASSOCIATION

The Beechy-Hymon association, like the Huntington-Egam-Wolftever, consists almost entirely of soils of the first bottoms (pl. 14). It covers only 3 percent of the total county area. The soils of the Beechy

^a See footnote 6, p. 142.

series predominate, although there is a fairly large acreage of Hymon soils. Some Briensburg soils of the colluvial land and a small acreage of Freeland soils of the high terraces are included. The soils are less desirable for crops than are those of the Huntington-Egam-Wolftever association, but they are well suited to pasture. Fourth- and Second-class soils predominate.

This association has predominantly a corn-hog type of farming. Owing to the large number of pasture adapted soils, cattle are more important than in the Huntington-Egam-Wolftever area. Cotton, corn, and sorghum sirup supply the cash-crop income. The flooding of the Kentucky Reservoir will remove most of the area from cultivation.

FORESTS *

Previous to the arrival of the first settlers, all of what is now Benton County was heavily forested, chiefly with deciduous trees (19). Numerous species of timber trees, including hickory, white oak, sweetgum, yellow-poplar, maple, ash, black walnut, and beech flourished in the virgin forests that grew on the fertile soils of the Huntington, Lindside, Safford, and Sequatchie series. The early settlers considered the forest an impediment to agriculture. They needed land for crop production, and the clearing of that land entailed much labor. They required for their simple needs only a small part of the timber removed from the land; therefore, most of the abundant supply was burned. Land clearing was a selective process in that the most fertile soils and the soils with the most suitable topography were the first cleared for cultivation; less desirable lands were cleared as the pressure of population and the demand for cropland increased.

The woodland on farms in 1929 showed an average return from sale and home use of \$1.73 per acre. Based on the number of farms reporting, the average size of farm woodland in 1940 was 55 acres. Approximately 61 percent of the land area of the county was in forest, of which 47 percent was in farm woodland, 48 percent private nonfarm forest, and 5 percent in public forest.

Ninety-three percent of the timber-producing forest area is upland hardwood; 4 percent, blackjack-oak hardwood; and 3 percent, bottom-land hardwood. As a further indication of the size and stage of development of the timber resources of the county, 24 percent of the total area in forest is classified as saw timber, 59 percent as cordwood, and 17 percent as below cordwood.

In some places there is a distinct correlation between soil associations and broad forest types. The bottom-land hardwood forest type covers all the Beechy-Hymon and the Huntington-Egam-Wolftever soil associations. Predominant species in these associations include red, black, and tupelo gums; willow, swamp white, water, and swamp chestnut oaks; green ash; sycamore; cypress; red birch; hackberry; willow; and red and silver maples. There are also limited areas of bottom-land hardwood in the Safford-Cuthbert-Ruston association northeast of Holladay near the junction of Little Birdsong and Birdsong Creeks. This area is an extension of the Huntington-Egam-Wolftever association.

* Prepared by G. B. Shivery, extension forester, University of Tennessee.

Limited areas of blackjack-oak hardwood occur in the Bodine-Ennis-Humphreys association east of Mountain Moriah, between Harmon and Sulphur Creeks, and also along the banks of the reservoir between Sulphur and Crooked Creeks. This forest type consists of a size and quality of timber generally not acceptable for sawing. The principal species in this forest type are post, blackjack, scarlet and white oaks, hickory, and blackgum; but it includes some sourwood, dogwood, red maple, and other oaks, particularly chestnut oak and Southern red oak.

The other soil associations have an upland-hardwood forest type on the well-drained soils that are intermediate in many of their characteristics between the poorly drained conditions of the Beechy-Hymon association and the dry, difficult growing conditions of the Bodine-Ennis-Humphreys association. Mixed oaks, hickory, yellow-poplar, blackgum, and basswood predominate and produce merchantable timber, except where they are damaged by forest fires and overcutting.

The principal forest soils are those of the Bodine, Cuthbert, Safford, and Ruston series. There is some correlation between the soils and the species of trees, but the aspect or direction towards which the slope faces is an influence on the composition of the species and quality of timber. For example, a more vigorous growth and a higher percentage of the more desirable species are obtained on north- and east-facing slopes. A similar result is noted on the lower part of long slopes.

Blackjack, scarlet, post, black, and chestnut oaks are dominant on the ridge and upper slopes of Bodine soils, whereas on the lower slopes in the semicolluvial positions, such species as white and Southern red oaks, scaly-bark and mockernut hickories, and chinquapin oak are dominant. Likewise blackjack and post oaks, with occasional scarlet and black oaks, predominate on the upper slopes of the Cuthbert soils, but red gum, yellow-poplar, white oak, blackgum, and red maple are on the lower slopes.

Safford soils are characterized by the predominance of white oak and beech in the forest cover. Yellow-poplar thrives on the lower slopes of Ruston soils. The Guin soils are poor for forest and support chiefly blackjack, chestnut, and post oaks and pignut hickory.

In 1942 there were 13 active sawmills in Benton County; in 1912, 16, including one large mill cutting over a million board feet per year; and in 1909, 38. In 1942 the production of lumber amounted to 72 thousand board feet of soft wood and 5,811 thousand feet of hardwood. In 1941, 200 cords of chestnut extract wood were produced.

A part of the forest in the county is burned annually. Most of the fires result from negligence in burning brush; a few are from incendiarism. Fire control is necessary not only for satisfactory forest production but also for maximum soil porosity and water control. Grazing control is necessary for similar reasons. Experiments prove that grazing does not pay; woodland grazing under intensities that allowed 2, 4, or 6 acres per animal unit without supplementary feeding resulted in serious deterioration of the animals over a 6-month season (2). The timber-producing capacity is gradually destroyed by the repeated browsing, and finally curtailment of tree reproduction results and the natural regeneration of the stand is prevented. Compaction of the soil, disturbance of humus, and resulting interference with soil porosity lessen water absorption.

An effort should be made to halt progressive deterioration of forest resources. A much greater value must be placed on the potential crop of saw-timber trees. The cut-over woodland and forest contain much cull timber that hinders the development of potential crop trees. Farm woodlands can be materially improved by using inferior trees for fuel and other minor farm needs or by cutting them for pulpwood or chemical wood. The vigorous trees then have an opportunity to grow into more valuable products. Forest improvement therefore consists of systematic cutting and use of crooked, short, bushy-topped, unsound, or slow-growing trees and of reserving for growth into final crop timber the straight, tall, well-crowned trees that are free of defect.

Sometimes it is necessary to resort to planting forest trees, particularly on the severely eroded Fourth- and Fifth-class soils (pl. 15). Every particular situation presents a specific problem. The technique of successful tree planting includes essential advance preparation, as breaking and mulching galled areas, building simple low check dams of brush in gullies, and plowing contour furrows. Preparation of severely gullied areas generally entails much labor. On areas involving less preparation the landowner is encouraged to do the entire job, using forest tree seedlings provided without cost by the Tennessee Valley Authority.

First, pioneer species must be selected that suit the characteristics of the particular soil. Preliminary examination of any area should take into consideration the degree of erosion, the exposure, and other local features. Farmers usually specify locust for their farm needs, especially for fence posts, but shortleaf pine is better adapted than locust to the severe growing conditions of most of the land available for forest. Black locust grows rapidly in the moist well-aerated fill material from soils like those of the Ruston and Bodine series, but they grow very slowly on material washed from acid clays. Locust plantings are a success on most fill material that consists of surface soil from the adjacent upland soils; they do very poorly on all severely eroded areas regardless of soil type, and in most places are almost a complete failure on severely eroded soils of the Dulac, Tippah, Lax, and Providence series.

Black locust can be grown successfully on many of the upland soils if lime and phosphate are applied in the preparation of the land, but heavy dependence must be placed on shortleaf and loblolly pine for most of the eroded lands that are not submitted to the intensive land preparation and fertilization. Loblolly pine seems to make a more vigorous early growth than the shortleaf pine on most of the soils and, consequently, it tends to stabilize erosion more quickly. Yellow-poplar and sweetgum grow rapidly in the fill material washed from the Ruston soils.

Forest has important indirect benefits aside from the wood products, especially on areas of land subject to erosion. A protective layer of forest litter absorbs the impact of the falling drops of water and thus preserves the tiny pores and channels between the soil particles through which the water makes its way downward. Fungi, bacteria, and tiny animals consume the litter and each other and the result is a dark-brown colloidal substance called humus, which improves both physical structure and fertility when it is carried downward into the mineral soil by percolating water. This litter and humus have, in addition,

great ability to absorb water directly. Dead roots decay and leave channels that increase porosity. The soil-binding function of the surface roots is highly beneficial; the densest network of roots is in the lower parts of well-developed litter layers.

Results obtained at the erosion station near Statesville, N. C., show a loss of only 0.002 ton of soil and 0.06 percent loss of rainfall from virgin woods (10). A companion wood plot, burned twice yearly, shows runoff of 11.5 percent and soil loss of 3.08 tons an acre, as compared with 0.06 percent and 0.001 ton an acre, respectively, on an unburned plot. Similar experiments at Zanesville, Ohio, for a 9-year period show on cultivated land, on pasture, and on woodland the runoff as 20.6 percent, 13.8 percent, and 3.2 percent, respectively, and soil loss an acre as 17.18 tons, 0.1 ton, and 0.01 ton (11). Both erosion control and maximum absorption therefore result from complete forest cover. Soil covered with old growth forest is more porous and absorbs water much more rapidly than the soil in cultivated fields. Where the forest cover is properly maintained, second-growth forested soil does not lose its porosity unless it is overgrazed or the litter is destroyed by fire (1).

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of the forces of weathering and soil development acting on parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the material (9). The climate, and its influence on soil and plants, depends not only on temperature, rainfall, and humidity but also on the physical characteristics of the soil or soil material and on the relief, which in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

Climate and vegetation are the active factors of soil genesis. They act on the parent material and change it from a mass of inert material to a body that has a definite morphology. The effects of climate and vegetation on the parent material are guided, or limited, to varying degrees by the modifying influence of relief as it affects such conditions as drainage, the quantity of water that percolates through the soil, and the rate of natural erosion. The nature of the parent material itself also guides the course of action that results in determining internal soil conditions and the kinds of vegetation that grow on the soil. Finally, time is necessary for the changes to take place, and age becomes a factor of soil genesis, as it reflects the degree of development of the soil into a body that is in equilibrium with its environment. The degree of such development depends not only on time, but also on the rate of action of the forces of climate and vegetation, as that rate is guided by the factors of relief and parent material.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one unless conditions are specified for the other four. They are so complex in their interrelations that many of the processes that take place in the development of soils are unknown.

The outstanding morphological characteristics of the soils of Benton County, as related to the factors of soil formation, are described in the following pages. Physical and chemical data are limited for these soils, and the discussion of soil genesis and morphology is correspondingly incomplete. The first part of the section deals with the environment under which the soils exist; the second, with specific soil series and the part environment has played in determining the morphology of the various soil types.

GENERAL ENVIRONMENT AND MORPHOLOGY OF SOILS

The parent materials of the soils of Benton County can be considered in two broad classes: (1) Materials residual from the weathering of rocks in place and (2) materials transported by water or gravity and laid down as unconsolidated deposits of clay, silt, sand, and rock fragments. Materials of the first class are related directly to the underlying rocks from which they were derived; materials of the second class, to the soils or rocks from which they washed or fell.

The residual parent materials are the residuum from the weathering of consolidated sedimentary rocks, limestone and unconsolidated rocks, loess, and Coastal Plain sand and clay. The properties of those materials are strongly reflected in many of the soil characteristics. These rocks were laid down as unconsolidated sediments, and some were gradually converted into consolidated rocks. Some of the rocks are so young, geologically, that they have not been consolidated.

Certain soils developed from residual materials are generally associated with particular rock formations or parts of formations. Soils of the Bodine series are associated with the Harriman, Camden, and Fort Payne chert formations; those of the Cuthbert and Shubuta series chiefly with the Eutaw formation; the Ruston and Savannah series chiefly with the McNairy sand member of the Ripley formation. The Safford soils are derived from the glauconitic sandy clays of the Coon Creek member of the Ripley formation; the Guin soils from gravel of extremely old river terrace deposits; the Dickson, Dulac, Tippah, Providence, Lax, and Mountview soils from a thin layer of loess.

Soils from transported rock materials reflect some of the properties of those materials. Soils of the Dexter, Freeland, Hatchie, Almo, Briensburg, Alva, Eupora, Shannon, Hymon, and Beechy series are derived from transported materials that consist mainly of Coastal Plain sand and clay and loess and products of their decomposition; soils of the Paden, Taft, Robertsville, Wolftever, Huntington, Lindsay, and Melvin series from mixed alluvium from several sources including limestone and products of their decomposition; the soils of the Bruno and Sequatchie series from transported materials that consist mainly of sandstone or sandy Coastal Plain materials. Soils of the Humphreys, Ennis, Lobelville, and Greendale series include material transported from cherty limestone.

Although a rather consistent relation exists between the kinds of parent material and some of the soil properties, other soil properties, especially those of regional significance to soil genesis, are not related to parent materials but are attributable to other factors.

The climate is temperate and continental, with long warm summers, short mild winters, and relatively high rainfall. The mod-

erately high temperatures favor rapid chemical reactions under the moist conditions that exist in the soil most of the time. The high rainfall favors intense leaching of soluble and colloidal materials downward in the soil. The soil is frozen only for short periods and to shallow depth during the winter; this further intensifies the weathering and translocation of material.

The general climate of the county is relatively uniform, but small local differences in soil climate exist, owing to variations in slope and exposure. On the south- and west-facing slopes the average temperature of the soil is somewhat higher than on the north- and east-facing slopes. Soil temperatures are also higher on the steeper slopes. The average moisture content of the soils is less on the south and west slopes than on the north and east slopes. These moisture and temperature conditions affect the length of time that the soil is frozen and the growth of vegetation. Although the differences are of small magnitude, they are significant and are possibly responsible for some of the local variations in the soils derived from similar parent material. Over the entire county, however, the differences in climate are not sufficient to account for the broad differences that exist among the soils. The relatively uniform climate is responsible for some of the outstanding properties that many of the soils have in common, but it cannot account for the broad differences that exist.

Trees, shrubs, grasses, and other herbaceous plants, micro-organisms, earthworms, and various other forms of plant and animal life live on and in the soil and are active agencies in the soil-forming processes. The nature of the changes that these various biological forces bring about depends, among other things, on the kinds of life and the life processes peculiar to each. The kinds of plants and animals that live on and in the soil are determined by environmental factors, including climate, parent material, relief, soil age, and the associated organisms. The influence of climate is most apparent, though not always most important, as a determinant of the kinds of macroflora that grow on the well-drained well-developed soils. In this way climate exerts a powerful indirect influence on the morphology of soils. Climate and vegetation acting together are the active factors of soil genesis.

A general oak-hickory forest association was on most of the well-drained well-developed soils, although locally there may have been large proportions of chestnut and yellow-poplar in the forest stands. There were probably differences in the density of stands, the relative proportion of species, and the associated ground cover. Taking the area as a whole, however, the forests have been relatively uniform, and it is doubtful that any of the marked differences in properties among the well-drained well-developed soils are the direct result of differences in vegetative cover.

Most of the trees that grow in this area are moderately deep to deep feeders on the plant nutrients in the soil. They are chiefly deciduous trees that shed their leaves annually. In content of various plant nutrients, the leaves range considerably among species, but, in general, the amounts of bases and phosphorus returned to the soil in leaves of deciduous trees are somewhat greater than in those of coniferous trees. In this way some essential plant nutrients are returned to the upper part of the soil from the lower part and tend to offset the depleting action of percolating waters.

Much organic material is added to the soil in the form of dead leaves, roots, and entire plants. Most of it is added to the A horizon, or topmost layer, where it is acted upon by micro-organisms, earthworms, and other forms of life, and by direct chemical reactions. In this county the rate of decomposition of such materials is rather rapid as a result of favorable temperature and moisture conditions, favorable character of the organic material itself, and presumably, favorable micro-population of the soil. Organic material does not accumulate on well-drained sites in this area to the extent that it does in cooler regions having similar drainage conditions. Little is known of the micro-organisms, earthworms, and other population of the soils of the area, but their importance is probably equal to that of the vegetation on the soil.

The well-drained well-developed soils have been formed under relatively similar conditions of climate and vegetation. It is on these soils that climate and vegetation have had the maximum influence with the minimum of modifications by relief and age. As a result, the soils developed from various kinds of parent material have many properties that are common to all.

In the virgin condition all the well-drained well-developed soils have a layer of organic debris in varying stages of decomposition on the surface. All have dark-colored A₁ horizons, with A₂ horizons lighter in color than either the A₁ or the B. The B horizon is generally uniformly colored yellow, brown, or red and is heavier textured than the A₁ or A₂. The C horizon is variable in color and texture among the different soils, but it is usually light red or yellow mottled with gray or brown.

These properties are common to all well-developed well-drained soils that have been subjected to similar conditions of climate and vegetation. They are, therefore, common to soils of zonal extent, and all soils that exhibit them can be called zonal soils. Zonal soils are members of one of the classes of the highest category in soil classification and are defined as those great groups of soils having well-developed soil characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms (9).

In places where the parent material has been in place only a short time, as in the case of recently transported materials, the soils have poorly defined or no genetic horizons. These soils are young and have few or none of the properties of zonal soils, and are therefore called azonal soils. Azonal soils are members of a second class of the highest category of soil classification and are defined as a group of soils without well-developed profile characteristics owing to their youth or conditions of parent material or relief that prevent the development of normal soil-profile characteristics (9).

These azonal soils have moderately dark to very dark A₁ horizons and apparently a moderately to fairly high content of organic matter. They are characterized by the absence of a zone of illuviation, or B horizon, and by parent material that is usually lighter in color than the A₁ horizon and that may be similar to, lighter than, or heavier than the A₁ horizon in texture. They may be referred to as AC soils because of the absence of a B horizon. The relief of these soils ranges from nearly level to very steep. Because the soil material has been in place for only a short time there is lack of horizon differentiation

in the level soils. Heavy runoff and erosion largely account for the lack of horizon differentiation in the steep phases.

On some nearly level areas where both internal and external drainage are restricted or where geologic erosion is very slow, soils whose materials have been in place a long time have certain well-developed profile characteristics that zonal soils do not have. Such soils are associated geographically with the zonal soils and are called intrazonal soils. They are defined as soils with more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effects of climate and vegetation (9). The properties of such soils in this area are generally the result of level relief influenced greatly by the character of the parent material and the kinds of vegetation that grow in such environments.

Soils of the three broad classes—zonal, azonal, and intrazonal—may be derived from similar kinds of parent material. Within any one of these classes, major differences are closely related to differences in the kinds of parent material from which they were derived. The thickness of soils developed from residual materials over the rock from which they were derived is a partial function of the resistance of the rock to weathering, the volume of the residue after weathering, and the rate of geologic erosion. The chemical and physical nature of the parent material modifies the rate and direction of chemical changes that result from climate and vegetation. The kind of parent material also exerts a pronounced influence on the kinds of vegetation that grow on the soil. Rocks have contributed to differences among soils also through their effects on relief.

The classification of the soils of Benton County in higher categories, as defined in the 1938 Yearbook of Agriculture (9), is given in table 7.

TABLE 7.—*Classification of the soil series of Benton County, Tenn., in higher categories*

ZONAL SOILS

Great soil group and series	Relief	Parent material
Red Podzolic soils:		
Lexington.....	Hilly.....	Thin layer of wind-deposited silt.
Ruston.....	do.....	Sandy Coastal Plain material.
Safford.....	Rolling to steep.....	Glaucconitic sandy clay Coastal Plain material.
Shubuta.....	Rolling.....	Sandy clay or clay Coastal Plain material.
Dexter.....	Undulating to rolling....	Alluvium from loess and Coastal Plain material.
Yellow Podzolic soils:		
Mountview.....	Rolling to hilly.....	Loess or loesslike material underlain by cherty limestone at 10 to 24 inches.
Humphreys.....	Undulating.....	Alluvium from cherty limestone.
Sequatchie.....	do.....	Alluvium from sand, sandstone, and some limestone.

TABLE 7.—*Classification of the soil series of Benton County, Tenn., in higher categories—Continued*

INTRAZONAL SOILS		
Great soil group and series	Relief	Parent material
Planosols:		
Dulac.....	Undulating to rolling...	Loess underlain by sandy clay Coastal Plain material at 24 to 42 inches.
Tippah.....	do.....	Loess underlain by clay Coastal Plain material at 24 to 42 inches.
Providence ¹	do.....	Loess underlain by sandy Coastal Plain material at 24 to 42 inches.
Lax.....	do.....	Loess underlain by gravel at 24 to 42 inches.
Dickson.....	do.....	Loess or loesslike material underlain by cherty limestone at 24 to 42 inches.
Savannah.....	do.....	Very fine sandy Coastal Plain material with small admixture of loess.
Paden.....	do.....	Highly mixed alluvium covered with thin loesslike silt mantle.
Taft.....	Nearly level.....	Do.
Robertsville.....	do.....	Do.
Freeland.....	Undulating to rolling...	Alluvium from loess and Coastal Plain material.
Hatchie.....	Nearly level.....	Do.
Almo.....	do.....	Do.
Wolfveer ²	Undulating.....	Alluvium from a wide variety of rocks including limestone.

AZONAL SOILS

Lithosols:		
Bodine.....	Rolling to hilly.....	Cherty limestone.
Cuthbert.....	Hilly to steep.....	Sandy clay or clay Coastal Plain material.
Guin.....	Rolling to steep.....	Gravel.
Alluvial soils:		
Alva.....	Undulating.....	Colluvium from loess and Coastal Plain material.
Eupora.....	do.....	Do.
Briensburg.....	do.....	Colluvium chiefly from loess.
Greendale.....	Undulating to rolling...	Colluvium from cherty limestone.
Huntington.....	Nearly level.....	Mixed alluvium partly from limestone.
Lindside.....	do.....	Do.
Melvin.....	do.....	Do.
Egam.....	do.....	Do.

¹ These soils have a siltpan less well developed than the siltpan of the true Planosols of this region, but owing to their Planosolic character they cannot be classified as zonal soils.

² These soils may not be true Planosols and may belong to the Yellow Podzolic group.

TABLE 7.—*Classification of the soil series of Benton County, Tenn., in higher categories—Continued*

AZONAL SOILS—Continued

Great soil group and series	Relief	Parent material
Alluvial soils—Con.		
Bruno-----	Nearly level-----	Alluvium chiefly from sands or sandstone but including limestone.
Ennis-----	do-----	Alluvium from cherty limestone.
Lobelville-----	do-----	Do.
Shannon-----	do-----	Alluvium from loess and Coastal Plain material.
Hymon-----	do-----	Do.
Beechy-----	do-----	Do.

RED PODZOLIC SOILS

The Red Podzolic soils are a zonal group of soils having thin organic and organic-mineral layers over a yellowish-brown leached layer that rests on an illuvial red horizon. The soils have developed under a deciduous or mixed forest in a warm-temperate moist climate (9). The soil-forming processes involved in their development are laterization and podzolization.

Soils of the Red Podzolic group in this county are listed in table 7. They have the common characteristics of Red Podzolic soils, and apparently all have developed under relatively similar conditions of climate and vegetation. They are well drained, and although they range somewhat in degree of maturity, all are sufficiently old to have at least a moderately well-developed Red Podzolic soil profile. They range from level to steep, but differences among the soil profiles are probably not due primarily to slope differences. There are marked differences among the parent materials of the various soils, and many of the differences among soil profiles can be correlated with differences among parent material.

LEXINGTON SERIES

The Lexington series, mapped in complex with the Ruston, developed from a thin layer of wind-deposited silt on hilly to steep relief. They are strongly to very strongly acid and low in water-holding capacity. See Lexington-Ruston complex, hilly phases, on page 78 for a profile description.

RUSTON SERIES

The Ruston soils have developed from loose sandy material on hilly to steep relief. The drainage, both external and internal, is moderate to rapid. The soils are therefore highly leached, very strongly acid in reaction, and moderately low in fertility. They have a moderately well-developed profile, but areas of weak horizon differentiation are found. The profile, however, has developed to the extent that the

Ruston soils are included in the zonal group of Red Podzolic soils. The profile development has been inhibited by the resistant character of the parent material and by the influence of steep slopes. The sand grains, which comprise a large part of the material, are highly resistant to disintegration, and the high water runoff on the steep slopes removes the finer particles at a rapid rate. The water-holding capacity of the material is low, and thus water for plant growth and energy for soil formation is low.

Following is a typical profile of Ruston fine sandy loam:

- A₁. 0 to 2½ inches, dark-gray loose loamy fine sand containing some partly decayed leaves and twigs and many fibrous roots.
- A₂. 2½ to 10 inches, yellowish-gray loose fine sandy loam containing some roots; has a poorly developed fine-crumb structure.
- A₃. 10 to 14 inches, light grayish-yellow loose fine sandy loam.
- B₁. 14 to 25 inches, reddish-brown very friable light fine sandy clay loam containing a few roots of all sizes; has a weakly developed medium heavy structure.
- C. 25 to 40 inches, reddish-brown or brownish-red friable sandy loam or light sandy clay loam; slightly brittle when dry.
- D. 40 to 60 inches +, yellowish-brown loose sands with layers of gray sand.

SAFFORD SERIES

The Safford soils, like the Ruston, have developed chiefly on hilly to steep relief, but unlike the Ruston soils, they have developed from heavy sandy clay material. This material is similar in texture and consistence to the material from which the Shubuta soil has developed, but it differs in containing considerable quantities of green sand—a material high in potash and comparatively high in phosphate. This combination of slope and parent material is largely responsible for the differentiating properties of the Safford soils. These soils have a characteristic white oak and beech forest vegetation that is apparently the result of rather than the cause for the character of the soils. The Safford are zonal Red Podzolic soils.

Following is a representative profile description of Safford very fine sandy loam:

- A₁. 0 to 1 inch, dark-gray loose very fine sandy loam containing a few small ferruginous sandstone fragments and numerous fibrous roots.
- A₂. 1 to 5 inches, yellowish-gray friable very fine sandy loam; a few small roots present.
- B₁. 5 to 8 inches, yellowish-brown friable clay loam.
- B₂. 8 to 20 inches, reddish-brown heavy clay or silty clay, hard when dry and sticky and strongly plastic when wet; has a strongly developed medium-sized angular nut (blocky) structure; several large roots penetrate this layer.
- B₃. 20 to 30 inches, reddish-brown to yellowish-red plastic heavy sandy clay streaked and splotched with greenish gray; structure of this layer less well developed than the one above, the particles are larger and the shapes less uniform; very few roots penetrate this layer.
- C. 30 to 45 inches, reddish-yellow sandy clay streaked and splotched with greenish-gray sandy material.
- D. 45 to 60 inches +, gray sandy clay splotched with yellow; contains considerable quantities of green sand and mica.

SHUBUTA SERIES

The Shubuta soil is a zonal Red Podzolic soil. It is highly weathered, leached, and well drained. The A, B, and C horizons are well defined. The soil is characterized morphologically by a loose

grayish-yellow A horizon and a heavy plastic sticky yellowish-red B horizon. Both the underlying material and relief are distinctive. The underlying material is an acid heavy sandy clay with conspicuous thin shalylike horizontal clay layers $\frac{1}{8}$ to 1 inch thick. The Shubuta soil is on areas of mild relief, and Cuthbert soils have developed where the relief is steep. It seems, therefore, that the particular combination of relief and parent material is chiefly responsible for the development of this soil.

The following profile is representative of Shubuta fine sandy loam:

- A₁. 0 to 2 inches, gray loose fine sandy loam stained dark with organic matter; contains a few ferruginous sandstone fragments and many small fibrous roots.
- A₂. 2 to 8 inches, grayish-yellow loose fine sandy loam; contains several ferruginous sandstone fragments $\frac{1}{2}$ to 2 inches across and numerous small roots.
- A₃. 8 to 10 inches, grayish-yellow friable clay loam.
- B₁. 10 to 20 inches, yellowish-red tough strongly plastic clay, with well-defined blocky structure about $\frac{1}{4}$ to $\frac{3}{4}$ inch in cross section; the surface of the particles is yellowish red, but the crushed material is reddish yellow; a few large roots are present.
- B₂. 20 to 25 inches, reddish-yellow tough plastic and sticky clay splotched with red and gray; the structure of this layer is less well defined than that of the B₁ layer; very few roots penetrate the layer.
- C. 25 to 36 inches, tough plastic and sticky clay highly mottled with red, yellow, and gray.
- D. 36 to 60 inches +, heavy sandy clay material highly mottled with red and yellow; thin layers of bluish-gray clay $\frac{1}{8}$ to 1 inch thick.

DEXTER SERIES

The moderately drained soils of the Dexter series are on high terraces. Their parent material is mixed alluvium washed from uplands underlain by loess and Coastal Plain sand and clay. The soils have developed under a deciduous forest vegetation, and their parent material is similar to that of the Freeland soils. The differences in the permeability of the underlying materials are probably largely responsible for the development of the different soils.

Representative profile of Dexter silt loam:

- A₁. 0 to 2 inches, dark grayish-brown mellow silt loam stained dark with organic matter.
- A₂. 2 to 7 inches, grayish-brown mellow silt loam with a weak soft-crumbs structure.
- A₃. 7 to 10 inches, light-brown very friable silt loam.
- B₁. 10 to 13 inches, yellow-brown friable heavy silt loam with a moderately well developed subangular nut structure; material crushes to a smooth yellowish-brown mass.
- B₂. 26 to 38 inches, brown or reddish-brown friable silty clay loam; less friable and heavier textured than layer above; structure also less well developed and more irregular in shape; crushed material is brownish yellow.
- C. 38 to 60 inches, yellowish-brown friable silty clay loam splotched with gray.

YELLOW PODZOLIC SOILS

Yellow Podzolic soils are a group of zonal soils having thin organic and organic-mineral layers over a grayish-yellow leached layer that rests on a yellow horizon (9). These soils have undulating to hilly relief and were developed under a forest vegetation that consisted mainly of deciduous trees. There may have been a somewhat less

luxuriant and different kind of undergrowth from the Red Podzolic soils of the county, although the degree of uniformity in this relation is unknown. Climatic conditions on the soils of the two groups were apparently much the same. The parent materials were derived from cherty limestone, loess, and terrace materials.

The causes of the development of the pronounced color differences between the Yellow Podzolic and the Red Podzolic soils are not known. The Yellow Podzolic soils of the area are generally associated with parent materials younger, lower in bases, or less well-drained internally than those of the Red Podzolic.

MOUNTVIEW SERIES

The soils of the Mountview series have developed from a thin loess or loesslike silt mantle over cherty limestone residuum. The relatively chert-free layer has a maximum thickness of about 20 inches; consequently, the soils are correlated as shallow phases. The B horizon is partly from loess and partly from cherty limestone residuum or a mixture of the two.

The soils are chiefly on narrow ridge crests in the cherty limestone hill section, but some areas are on ridge slopes. The slope ranges from 5 to 25 percent, but most areas have less than a 20-percent gradient. These soils have developed under a natural vegetation of deciduous hardwood consisting chiefly of white, red, post, and black-jack oaks and hickory. They are similar to the Dickson soils in position and in parent material and differ chiefly in not having a siltpan. The shallowness of the silt layer and the slightly better drainage have probably been largely responsible for the lack of a siltpan. The Mountview soils have well-drained well-developed profiles and are in a zonal group of Yellow Podzolic soils.

Following is a representative profile of Mountview silt loam, shallow phase:

- A. 0 to 1 inch, gray loose silt loam stained dark with organic matter.
- A₁. 1 to 8 inches, grayish-yellow or yellowish-gray mellow silt loam.
- B. 8 to 12 inches, light yellowish-brown friable heavy silt loam with a fine weak-crumb structure.
- B₁. 12 to 24 inches, yellowish-brown or brownish-yellow friable silty clay loam with a moderately well-developed blocky structure; grades into a cherty silty clay loam at a depth of about 16 inches.
- C. 24 inches +, brownish-yellow cherty silty clay loam splotted with brown, yellow, and gray; varies in thickness and extends to cherty limestone.

HUMPHREYS SERIES

The Humphreys soils are on low terraces along the streams in the cherty limestone hill section. They have developed on nearly level areas under a deciduous forest. Their parent material consists of general stream alluvium, nearly all of which has been washed from cherty soils but which includes some loess materials in places. Generally these soils are subject to infrequent overflow and thus receive some additional sediments. They are well-drained relatively young soils that show little profile development. In most places, however, the profile is sufficiently well-developed for the soil to be included with the Yellow Podzolic soils.

Following is a representative profile of Humphreys silt loam :

- A. 0 to 2 inches, grayish-brown mellow silt loam stained dark with organic matter.
- A₁. 2 to 7 inches, grayish-brown mellow silt loam with a poorly developed soft-crumb structure.
- A₂. 7 to 9 inches, light-brown friable silt loam with a weak-crumb structure.
- B₁. 9 to 12 inches, yellowish-brown friable heavy silt loam.
- B₂. 12 to 23 inches, brown or yellowish-brown friable heavy silt loam or silty clay loam; has a very weak fine blocky structure.
- B₃. 23 to 30 inches, brownish-yellow friable silt loam; has a very weakly developed blocky structure.
- C. 30 inches +, yellow friable silt loam spotted with gray and bright yellow; contains some water-worn chert fragments; beds of water-worn chert encountered in most places at depths of 30 to about 60 inches.

SEQUATCHIE SERIES

The Sequatchie soil occurs on low terraces of the Tennessee River. It has formed from general stream alluvium in which sandy materials predominate under conditions of moderately slow external drainage and moderate internal drainage. They were developed under a hardwood forest and under climatic conditions similar to those of other zonal soils of the county. Some of the materials from which the soils are derived were so recently deposited, however, that only weak profile development is apparent. In most places the profile is that of a Yellow Podzolic soil.

A representative profile of Sequatchie fine sandy loam is as follows :

- A. 0 to 3 inches, grayish-brown loose fine sandy loam stained dark with organic matter.
- A₁. 3 to 10 inches, light-brown to grayish loose fine sandy loam containing a moderate quantity of organic matter.
- B₁. 10 to 30 inches, brown or yellowish-brown friable fine sandy clay loam that grades into brownish yellow in lower part of horizon; generally has a weakly developed blocky structure.
- C. 30 inches +, brownish-yellow friable clay loam lightly spotted with gray and yellow.

PLANOSOLS

Planosols are an intrazonal group of soils with eluviated surface horizons underlain by B horizons more strongly illuviated, cemented, or compacted than associated normal soils. They have developed on a nearly flat upland surface under grass or forest vegetation in a humid or subhumid climate (9).

In Benton County most of the soils classed as Planosols are characterized by a siltpan at a depth of about 2 feet. These soils vary from moderately well drained to poorly drained, and some of those more poorly drained have claypans rather than siltpans. The siltpan is not a zone of high clay concentration; in fact, the clay content appears to be rather low. The material is compact rather than cemented, although there may be some silica cementation.

The climatic conditions under which these soils developed were similar to those under which the zonal soils formed, but the soils are more moist and less well aerated. Some differences probably existed in kinds of vegetation, although deciduous forest was on both. The relief is such that geologic erosion would be slow, but that factor alone is not the cause of their formation. It has been observed

that the siltpan soils in this county are formed from parent material very high in silt and very fine sand and low in clay and coarse sand. They are also underlain by material that restricts internal drainage. In general, the thicker and more compact siltpan are associated with the less permeable underlying material and the areas with the least sloping surface.

DULAC SERIES

The Dulac soils have developed from a 24- to 42-inch layer of loess underlain by semipervious Coastal Plain material (pl. 5, *B*). This underlying material may consist of heavy sandy clay, alternate layers of sand and clay, or sand that has a horizontal layer of ferruginous sandstone near the contact of the silt and sand.

Following is a description of a representative profile of Dulac silt loam:

- A. $\frac{1}{2}$ to 0 inch, partly decomposed leaves, bark, and twigs.
- A₁. 0 to 2 inches, gray mellow silt loam stained dark with organic matter; numerous fibrous roots.
- A₂. 2 to 7 inches, yellowish-gray mellow silt loam; contains numerous roots of all sizes.
- A₃. 7 to 9 inches, grayish-yellow friable heavy silt loam.
- B₁. 9 to 20 inches, yellowish-brown friable silty clay loam changing gradually to brownish-yellow in the lower part of the horizon; material breaks into fine to medium weak blocky structure; yellowish-brown particles crush to a smooth yellow mass; some large roots penetrate this layer.
- B₂. 20 to 24 inches, brownish-yellow friable silty clay loam lightly spotted with yellow and gray.
- Pan. 24 to 42 inches, very compact silty clay loam highly mottled with gray, yellow, and brown; material breaks into coarse fairly well-developed structural particles irregularly blocky to prismatic in shape; contains several small concretions; vertical cracks, $\frac{1}{4}$ to 1 inch in width, are common, and in most places they are filled with a light-gray silty material; very few roots penetrate this layer.
- D. 42 to 60 inches +, slowly permeable heavy sandy clay highly mottled with red, yellow, brown, and gray.

TIPPAH SERIES

The Tippah soil has developed from a thin layer of loess overlying Coastal Plain material. It differs from the Dulac soils in being underlain by heavy acid clay that is relatively impervious to water. In general, the layer of silt is not so thick as that from which the Dulac soils have developed. The imperviousness of the underlying material has apparently resulted in more rapid runoff and more geologic erosion. The A and B horizons are similar to those of the Dulac soils, but the siltpan does not average so thick, and, owing to the mixing of the silt with the underlying clay, it is somewhat heavier in texture.

Following is a description of a representative profile of Tippah silt loam, eroded rolling phase:

- A₁. 0 to $1\frac{1}{2}$ inches, dark-gray mellow silt loam stained dark with organic matter; contains many small fibrous roots.
- A₂. $1\frac{1}{2}$ to 7 inches, grayish-yellow mellow silt loam; contains a few roots of all size.
- B₁. 7 to 10 inches, brownish-yellow friable light silty clay loam.
- B₂. 10 to 18 inches, yellowish-brown to brownish-yellow friable silty clay loam; has a small to medium weakly defined blocky structure; yellowish-brown particles crush to a smooth yellow mass.

- B. 18 to 22 inches, brownish-yellow friable silty clay loam lightly splotted with gray; texture somewhat heavier and structure more distinct than in above layer.
- Pan. 22 to 38 inches, very compact heavy silty clay loam mottled with gray, yellow, and brown; has a fairly well-defined coarse blocky structure.
- D. 38 to 60 inches +, tough plastic sticky clay highly mottled with gray, yellow, and red; grades into bluish-gray clay.

PROVIDENCE SERIES

The Providence soils, like the Dulac and Tippah, have developed from a shallow layer of loess over unconsolidated Coastal Plain material. The underlying material differs from that of the Dulac and Tippah soils in being lighter in texture and more permeable. The A and B horizons of these soils are similar to those of the Dulac, but the siltpan is thinner and less compact. The silt in the lower layers is mixed with sand from the underlying material in many places.

Following is a description of a representative profile of Providence silt loam:

- A. 0 to 1½ inches, medium-gray mellow silt loam stained dark with organic matter; contains numerous fibrous roots.
- A. 1½ to 6 inches, yellowish-gray mellow silt loam; contains numerous fibrous roots.
- A. 6 to 9 inches, grayish-yellow mellow silt loam.
- B. 9 to 11 inches, brownish-yellow friable heavy silt loam.
- B. 11 to 24 inches, yellowish-brown friable light silty clay loam; has a weak blocky structure; particles are yellowish brown, but the crushed material is yellow; several large roots penetrate the layer.
- B. 24 to 30 inches, brownish-yellow friable heavy silt loam lightly splotted with gray.
- Pan. 30 to 42 inches, brownish-yellow fine sandy clay loam or silty clay loam splotted with yellow and gray; moderately compact in place, but the brittle material crushes readily when removed; the displaced material breaks into moderately well-defined medium-sized angular nutlike particles; a few roots penetrate this layer.
- D. 42 to 60 inches +, brownish-yellow brittle sandy clay loam or heavy sandy loam streaked with gray; relatively permeable to water.

LAX SERIES

The Lax soils are very similar to the Dulac soils, except in character of underlying material. They have developed from a 24- to 42-inch layer of loess underlain by a weakly cemented layer of gravel.

Following is a description of a representative profile of Lax silt loam.

- A. 0 to 2 inches, medium-gray mellow silt loam stained dark with organic matter; numerous fibrous roots.
- A. 2 to 6 inches, grayish-yellow or yellowish-gray mellow silt loam; several small roots.
- B. 6 to 8 inches, light brownish-yellow friable heavy silt loam.
- B. 8 to 20 inches, yellowish-brown friable silty clay loam changing gradually to brownish yellow in the lower part of the horizon. The material has a weak blocky nutlike structure.
- B. 20 to 27 inches, yellow friable silty clay loam splotted with gray.
- Pan. 27 to 40 inches, compact silty clay loam mottled with gray, yellow, and brown. The material is compact in place, but displaced lumps crush readily; material also breaks into coarse fairly well-defined angular irregularly shaped particles; very few roots penetrate the layer.
- D. 40 to 60 inches +, quartz and chert gravel weakly cemented with silty material.

DICKSON SERIES

In this county a large part of the parent material from which the Dickson soils have developed is from loess, although a part of the loesslike silt is probably derived from the weathering of the underlying cherty limestone. In the counties farther east, however, the Dickson soils have evidently developed from parent material that has weathered mostly from the underlying cherty limestone. These soils differ from the Dulac soils chiefly in having highly siliceous cherty limestone residuum underneath the siltpan.

Following is a description of a representative profile of Dickson silt loam:

- A₁. 0 to 1 inch, medium-gray mellow silt loam stained dark with organic matter; numerous fibrous roots.
- A₂. 1 to 6 inches, yellowish-gray mellow silt loam; several small roots.
- A₃. 6 to 8 inches, grayish-yellow friable heavy silt loam.
- B₁. 8 to 20 inches, yellowish-brown friable silty clay loam changing gradually to brownish yellow in lower part; has a poorly defined medium blocky structure and contains several large roots.
- B₂. 20 to 24 inches, yellow friable silty clay loam lightly spotted with gray.
- Pan. 24 to 38 inches, compact silty clay loam mottled with gray, yellow, and brown; material is compact in place, but when displaced it crumbles readily into fairly well-defined structural particles, which are very irregular in shape and range from $\frac{1}{2}$ to $1\frac{1}{4}$ inches in cross section.
- D. 38 to 60 inches +, very cherty silty clay loam mottled gray and yellow.

SAVANNAH SERIES

The Savannah soils, unlike the other soils in the county that developed from unconsolidated sand and clay, have formed on undulating to rolling relief. These soils have a yellow B horizon and a compact layer just below. The parent material is derived from unconsolidated Coastal Plain material that probably contains a small mixture of loess. Like the parent material of the Providence soils, it is high in very fine sand and silt and low in coarse sand.

Following is a description of a representative profile of Savannah very fine sandy loam:

- A₁. 0 to 1 inch, gray loose very fine sandy loam stained dark with organic matter; numerous small fibrous roots.
- A₂. 1 to 8 inches, grayish-yellow loose very fine sandy loam; a few small roots.
- B₁. 8 to 18 inches, yellowish-brown friable light clay loam or silty clay loam; has a weakly developed fine blocky structure; several large roots penetrate this layer.
- B₂. 18 to 25 inches, brownish-yellow friable clay loam lightly spotted with gray in the lower part of the profile.
- Pan. 25 to 40 inches, compact brownish-yellow fine sandy clay loam spotted with gray, yellow, and brown; compact in place, but displaced lumps are brittle and break easily into coarse, irregularly shaped, weakly defined particles; very few roots penetrate this layer.
- C. 40 to 60 inches +, reddish-brown fine sandy clay spotted with gray and yellow.

PADEN SERIES

The moderately well-drained Paden soils are on high terraces. They are characterized by a siltpan at a depth of about 2 feet. In most places they have apparently developed from a thin layer of loess underlain by highly mixed old alluvium. In some places, however, they

may have developed from the Tennessee River alluvium that includes materials from limestone, shale, sandstone, Coastal Plain sand and clay, and loess. This material is high in content of silt and very fine sand and low in coarse and medium sands.

Following is a profile of Paden silt loam :

- A₁. 0 to 1 inch, medium-gray mellow silt loam stained with organic matter.
- A₂. 1 to 8 inches, grayish-yellow mellow silt loam.
- B₁. 8 to 10 inches, brownish-yellow friable heavy silt loam.
- B₂. 10 to 20 inches, yellowish-brown friable silty clay loam of fine or medium-weak blocky structure.
- B₃. 20 to 24 inches, brownish-yellow friable silty clay loam lightly spotted with yellow and gray.
- Pan. 24 to 42 inches, brownish-yellow compact silty clay loam spotted with yellow and gray; has a coarse, moderately well-developed, irregularly shaped structure; many particles are coated with gray silty material.
- C. 42 to 60 inches +, brittle silty clay loam highly mottled with red, brown, yellow, and gray.

TAFT SERIES

The soil of the Taft series is intermediate between the Paden and Robertsville in drainage and similar to the Hatchie in drainage and many profile characteristics. Both external and internal drainage are slow. The Taft soil is on nearly level to gently sloping terraces of the Tennessee River and is underlain by old stream alluvium washed partly from limestone material. On the high terraces, this alluvium is probably covered by a thin layer of loess. This soil is associated with Paden soils on high terraces and with Wolftever or Humphreys soils on the low terraces.

The following is a description of a representative profile of Taft silt loam :

- A₁. 0 to 2 inches, dark-gray mellow silt loam stained with organic matter.
- A₂. 2 to 8 inches, yellowish-gray mellow silt loam containing a few soft brown concretions.
- B₁. 8 to 15 inches, pale-yellow friable silty clay loam slightly spotted with gray in lower part of profile.
- B₂. 15 to 24 inches, friable silty clay loam highly mottled with gray, yellow, and brown; contains large soft brown concretions.
- Pan. 24 to 42 inches, very compact silty clay loam; material breaks into coarse, irregularly shaped particles coated with bluish gray; crushed particles highly mottled with gray, yellow, and brown.
- C. 42 to 60 inches +, yellowish-brown brittle heavy silty clay loam spotted with yellow and gray.

ROBERTSVILLE SERIES

The Robertsville soil is similar to the Almo in a number of characteristics—it has developed on terraces, has a compact layer below the subsoil, is poorly drained, and is light colored. It has developed from old alluvium similar to that giving rise to the Taft and Wolftever soils and is on nearly level or depressed positions on low terraces. Both internal and external drainage are very slow, and the poorer drainage, which results in differences in internal climate and conditions for biological activity, is chiefly responsible for the differences between this soil and that of the Taft series.

Following is a typical profile of Robertsville silt loam:

- A₁. 0 to 2 inches, dark-gray mellow silt loam stained with organic matter and spotted with rust brown; layer contains numerous large ($\frac{1}{8}$ to $\frac{1}{2}$ inch) brown concretions.
- A₂. 2 to 8 inches, mellow silt loam mottled with dark gray and rust brown; layer contains numerous large soft brown concretions.
- B₂. 8 to 22 inches, friable silty clay loam highly mottled with light gray and pale yellow; becomes predominantly light gray in lower part of horizon.
- Pan. 22 to 40 inches, bluish-gray compact heavy silty clay loam; contains numerous large soft brown concretions.
- C. 44 to 60 inches +, yellowish-brown brittle heavy silty clay loam spotted with yellow and gray.

FREELAND SERIES

The Freeland soils are characterized by a siltpan and apparently belong to the Planosol group of intrazonal soils. Morphologically, they are similar to the Dulac soils of the uplands and to the Paden soils of the high terraces of the Tennessee River. They have developed from old mixed alluvium washed from uplands underlain by loess and Coastal Plain material. A thin layer of loess has been deposited over the old alluvium on some of the older terraces. The soils have developed under moderately slow internal drainage on undulating to rolling relief from materials very high in silt. The parent material is similar to that of the Dexter soils, and the restricted internal drainage is apparently responsible for the differences between the Freeland and Dexter soils.

Following is a description of a representative profile of Freeland silt loam:

- A₁. 0 to 1 inch, medium-gray mellow silt loam stained dark with organic matter.
- A₂. 1 to 6 inches, yellowish-gray mellow silt loam.
- A₃. 6 to 9 inches, grayish-yellow friable heavy silt loam.
- B₂. 9 to 18 inches, yellowish-brown friable silty clay loam with a weak fine blocky structure.
- B₃. 18 to 24 inches, brownish-yellow friable silty clay loam.
- Pan. 24 to 42 inches, brownish-yellow compact silty clay loam spotted with gray and yellow; material compact in place but brittle and easily broken when displaced; has a medium, weakly developed, irregularly shaped structure.
- C. 42 to 60 inches +, reddish-brown brittle sandy clay loam spotted with yellow; contains several small pebbles.

HATCHIE SERIES

The soil of the Hatchie series occurs on nearly level to gently sloping areas in association with the Freeland soils. It differs from the Freeland soils in being imperfectly drained—both external and internal drainage are slow. Like the Freeland soils, it has developed from similar old alluvium and is silty in texture and acid in reaction and has a siltpan at a depth of about 2 feet.

Following is a description of a representative profile of Hatchie silt loam:

- A₁. 0 to 2 inches, dark-gray mellow silt loam stained dark with organic matter.
- A₂. 2 to 7 inches, gray mellow silt loam containing several small brown concretions.
- A₃. 7 to 10 inches, yellowish-gray friable silt loam.

- B. 10 to 20 inches, pale-yellow friable silty clay loam spotted with gray and bright yellow in the lower part of horizon with a poorly developed fine blocky structure; the layer contains several small brown concretions.
- B. 20 to 24 inches, friable silty clay loam highly mottled with yellow and gray, contains numerous brown concretions.
- Pan. 24 to 44 inches, very compact silty clay loam highly mottled with yellow, gray, and rust brown; material breaks out into coarse irregularly shaped particles coated with bluish-gray material; the layer contains numerous concretions.
- C. 44 to 60 inches +, pale-yellow brittle silty clay loam spotted with gray and rust brown and streaked with bluish gray.

ALMO SERIES

The Almo soil has developed from the same general type of alluvium as the Freeland and Hatchie soils, with which it is associated. It differs from the Hatchie soil chiefly in being poorly drained but is similarly highly leached, acid in reaction, and low in organic matter, and also is similar in siltpan development. This soil is included in the Planosol group of intrazonal soils.

Following is a description of a representative profile of Almo silt loam:

- A₁. 0 to 2 inches, medium-gray mellow silt loam spotted with light gray.
- A₂. 2 to 8 inches, gray mellow silt loam spotted with light gray and rust brown; contains a few small brown concretions.
- B. 8 to 10 inches, grayish-yellow friable heavy silt loam spotted with gray and yellow.
- B. 10 to 22 inches, mottled yellow and gray friable silty clay loam; contains several concretions.
- Pan. 22 to 42 inches, compact silty clay loam highly mottled with gray, yellow, and brown; bluish-gray material coats the structural particles; layer contains numerous concretions.
- D. 42 to 60 inches +, moderately friable silty clay loam mottled with yellow and gray.

WOLFTEVER SERIES

The Wolftever soils are characterized by a moderately compact subsoil. They are on nearly level low young terraces of the Tennessee River and are moderately well drained, but their drainage, both internal and external, is moderately slow. The general alluvium from which the soils have developed is washed partly from uplands underlain by limestone, but it includes material from a wide variety of rocks. Although high in silt, this material is higher in clay content than the parent material of most of the Planosols in this county. The Wolftever soils are on young terraces, and it seems unlikely that the profile is entirely a result of soil-forming processes. They are partly the result of deposition of very fine material on what are now the substratum and the subsoil layers. There is some question as to whether these soils correlate better with the Planosols than with the Yellow Podzolic soils.

LITHOSOLS

Lithosols are an azonal group of soils having no clearly expressed soil morphology and consisting of a recently and imperfectly weathered mass of rock fragments (9). They are largely confined to steeply sloping land, and geologic erosion is therefore relatively rapid. The soils generally consist of easily eroded material, and consequently much

soil is removed from the surface or mixed to such an extent that soil-forming processes do not have a sufficient length of time to act on them and produce well-defined genetic soil properties. As mapped, these soils may include small areas of zonal soils.

Two land types mapped in this county are man-made Lithosols. They are the two kinds of rough gullied land, and the true soil has been lost from most of their areas because of accelerated erosion induced by man's activities.

BODINE SERIES

Members of the Bodine series are chiefly on hilly to steep slopes in the highly dissected parts of the cherty limestone hill section. The slope ranges from about 5 to 60 percent, but most areas have a range of 20 to 40 percent. Drainage is rapid to very rapid both internally and externally. The Bodine soils have developed from material that is residual from the weathering of highly cherty level-bedded Mississippian and Devonian limestones, and the soils are everywhere characterized by a high content of chert fragments. The soils are highly leached, strongly to very strongly acid in reaction, and low in fertility.

Profile development has been considerably retarded by (1) the highly resistant character of the parent material and (2) the steep slope. The chert fragments, which comprise a large proportion of the material, are highly resistant to disintegration and become available for soil formation at an exceedingly slow rate. In some places, especially on the lower parts of long slopes, chert fragments and soil material have sloughed down from above, resulting in a considerably deeper soil than is typical.

Owing to the strong relief and consequent rapid runoff, little water remains for plant growth, the energy for soil formation is low, and the soil material tends to be removed rather rapidly. Actually, therefore, parent material does not become available fast enough or remain in place long enough for the soil-forming agencies—climate and vegetation—to form well-developed genetic soil profiles. Consequently, the Bodine profiles have not developed to the extent that the soils would be included in the zonal group of Yellow Podzolic soils but instead are included with the azonal Lithosols.

Following is a description of a representative profile of Bodine cherty silt loam:

- A₁. 0 to 2 inches, dark-gray loose cherty silt loam stained dark with organic matter; contains a few small roots.
- A₂. 2 to 7 inches, yellowish-gray or brownish-gray cherty silt loam; numerous roots are present.
- A₃. 7 to 18 inches, brownish-yellow friable cherty heavy silt loam
- C. 18 to 60 inches +, yellow or brownish-yellow cherty silt loam or light silty clay loam lightly spotted with gray; grades into partly weathered beds of angular chert; cherty limestone bedrock at a depth of 10 to 30 feet.

CUTHBERT SERIES

The Cuthbert soils have developed on hilly or steep slopes from marine deposits of heavy acid sandy clay, which in most places is characterized by thin shalylike layers of bluish-gray clay. The soils were developed under a climate similar to that of the zonal soils of the county.

The Cuthbert soils are shallow and do not have well-developed profiles. The parent material is similar to that of the Shubuta soils of the Red Podzolic group, but because of the steep slopes and the erosive character of the material itself, it is removed by geologic erosion nearly as rapidly as it is formed. A normal zonal soil profile cannot form under such a condition; consequently, the Cuthbert are essentially AC soils.

The following profile description is representative of Cuthbert fine sandy loam:

- A₁. 0 to 2 inches, gray loose fine sandy loam stained dark with organic matter; contains a number of ferruginous sandstone fragments.
- A₂. 2 to 10 inches, gray to grayish-yellow loose fine sandy loam; contains several ferruginous sandstone fragments.
- A₃. 10 to 14 inches, grayish-yellow friable clay loam.
- C. 14 to 25 inches, predominantly reddish-yellow strongly plastic clay highly mottled with red, yellow, and gray; varies considerably in thickness, color, mottling, and texture.
- D. 25 inches +, heavy sandy clay highly mottled with red and yellow; contains thin horizontal layers of bluish-gray clay.

GUIN SERIES

The Guin soils have developed chiefly on hilly or steep slopes from beds of loose gravel. They are highly leached, strongly to very strongly acid, low in fertility, and do not have well-developed A, B, and C horizons. The profile development has been impaired by the highly resistant character of the parent material and the steep slopes. The chert and quartz gravel, which comprises a large portion of the material, is highly resistant to disintegration, and material becomes available for soil formation at an exceedingly slow rate. The material is low in water-holding capacity and the energy for soil formation is low. Also, the rapid runoff on the steep slopes tends to remove the fine soil particles rapidly. Parent material, therefore, does not become available fast enough and does not remain in place long enough for the soil-forming agencies—climate and vegetation—to form well-developed genetic soil profiles.

Following is a representative profile of Guin gravelly loam:

- A₁. 0 to 2 inches, dark-gray loose gravelly loam stained dark with organic matter; numerous fibrous roots.
- A₂. 2 to 10 inches, yellowish-gray loose gravelly loam; contains a few roots.
- C. 10 to 30 inches, gray or grayish-yellow loose gravelly loam; contains very few roots.
- D. 30 to 60 inches +, beds of loose quartz and chert gravel mixed with brownish-red sandy material.

ALLUVIAL SOILS

Alluvial soils are an azonal group of soils developed from transported and relatively recently deposited material, alluvium, characterized by a weak or no modification by soil-forming processes (9). In Benton County these soils are on first-bottom lands along streams and on foot slopes. They have nearly level or gently sloping relief and good to very slow internal drainage. Their main common properties are those related to the lack of soil profile in which the horizons are genetically related. Although derived from similar parent material, they may differ in drainage conditions, causing differences in properties. Alluvial soils derived from similar parent material but dif-

ferent in drainage have been differentiated mainly on the basis of properties associated with good, imperfect, or poor drainage.

ALVA AND EUPORA SERIES

The soils of the Alva and Eupora series have formed from recent local alluvium or colluvium consisting of a mixture of loess and Coastal Plain material. In most places, additional materials are being added. These soils are on gently sloping areas at the base of the slopes from which the materials have washed or sloughed. The external drainage is moderate, but internal drainage varies from slow to moderate. The parent material is so young that the forces of climate and vegetation have not significantly affected them, and consequently the soils do not have genetically related horizons.

The Alva are brown or grayish-brown well-drained soils free of mottling to a depth of 24 to 36 inches. The imperfectly drained Eupora soils are grayish brown, but highly mottled with gray, yellow, and rust brown below about 16 inches.

BRIENSBURG SERIES

The Briensburg soil is similar to the Eupora in drainage and position; differences between the two are closely associated with differences in parent material. The Briensburg soil was formed from local alluvium or colluvium washed from uplands underlain chiefly by loess. It is on gently sloping areas below the upland slopes from which the material has washed. External drainage is moderate; internal drainage, slow. Seepage from the adjacent slopes is responsible for the imperfect drainage in most places. This young soil does not have genetically related horizons. It is a grayish-brown silt loam highly mottled with gray and rust brown below about 16 inches.

GREENDALE SERIES

The nearly level to sloping Greendale soils are on foot slopes along intermittent streams and on alluvial-colluvial fans. The parent material consists of local alluvium and colluvium washed chiefly from the Bodine soils. It has been recently deposited, and in most places there are frequent additions of material from the adjoining upland slopes. As a result, since the soils are young and generally have little profile development, they are included with the alluvial soils.

Following is a description of Greendale cherty silt loam:

- 0 to 10 inches, grayish-brown or brownish-gray friable cherty silt loam.
- 10 to 20 inches, yellowish-brown friable cherty silt loam or light cherty silty clay loam.
- 20 inches +, brownish-yellow very cherty silt loam splotted with gray.

HUNTINGTON, LINDSIDE, AND MELVIN SERIES

The Huntington, Lindside, and Melvin soils are derived from young general stream alluvium washed partly from limestone material. All these soils are nearly level to slightly depressional and do not have developed profiles. They have formed under hardwood forest, the association of trees varying somewhat among the soil series, depend-

ing on differences in drainage. The differences in these soils are closely associated with drainage. In general, they are higher in bases, phosphorus, nitrogen, and humus than are the associated zonal soils of the uplands.

The Huntington soil is a brown silt loam to a depth of 24 inches or more, below which the material is splotched with gray and yellow. In many places, the upper part is a brown mellow silt loam to a depth of 8 to 12 inches, and the lower part is light-brown friable silty clay loam. This difference between layers may be partly due to soil-forming processes, but it is more likely the result of deposition.

The Lindsides soils are intermediate in drainage between the well-drained Huntington soil and the poorly drained Melvin soil. The material composing the Lindsides soils has generally originated in the same areas as that composing the Huntington. In general, the soils consist of brown mellow silt loam to a depth of about 12 inches. Below this, the material is similar or slightly heavier in texture, but its mottling with gray, yellow, and rust brown indicates that it remains waterlogged much of the time.

The poorly drained Melvin soil is associated with the Huntington, Lindsides, and Egam. Much of the material comprising the Melvin soil originated in the uplands underlain by limestone, but considerable variation was allowed in mapping. The soil is prevailingly light-colored and highly mottled from the surface downward.

EGAM SERIES

The dark-colored moderately well-drained Egam soil is on the high first bottoms along the Tennessee River. The alluvium is similar in origin to that of the Huntington soil, but it was deposited in slack water, or where the rate of flow was very slow, and sediments consist of much heavier materials. Egam silty clay loam has a dark grayish-brown to almost black slightly compact silty clay loam surface soil to a depth of about 12 inches. The material below this consists of a moderately compact grayish-brown to yellowish-brown silty clay loam. This difference between the surface soil and the subsoil is probably partly caused by soil-forming processes. This soil, however, is only weakly modified by soil-forming processes.

BRUNO SERIES

The Bruno soil is on first bottoms of the Tennessee River and consists chiefly of material washed from uplands underlain by sandstone or sandy Coastal Plain material. It occurs mainly on the high natural levees and consists of material deposited by swiftly flowing floodwaters—waters that dropped chiefly the coarser particles. These sediments were apparently influenced considerably by limestone material. The soil consists of light-brown or yellowish-brown loose loamy sand to a depth of about 12 inches. The material below this is brownish-yellow or light-brown loose loamy sand.

ENNIS AND LOBELVILLE SERIES

The young Ennis and Lobelville soils have formed from material washed from uplands underlain by cherty limestone. They are along all the major streams in the cherty limestone hill section of the county. Their parent material has not been significantly altered by soil-forming processes.

The Ennis soils, like the Huntington soil which they resemble, are well drained and predominantly brown. They are lighter in texture, however, and in general lower in bases, phosphorus, nitrogen, and humus than the Huntington soil. The Ennis are characterized by varying quantities of chert fragments throughout the profile. They consist of brown to grayish-brown silt loam to a depth of about 12 inches. Below this, the material is light-brown friable silt loam with some gray splotches below a depth of about 24 inches. Beds of chert fragments are generally at a depth of 3 to 5 feet. The cherty type of this soil contains sufficient water-worn chert fragments in the plow layer to interfere materially with cultivation.

The Lobelville soil, like the Ennis, has developed from material washed chiefly from uplands underlain by cherty limestone. It differs from the Ennis soils chiefly in being less well drained, but it is similar to the Lindsides and Hyman soils in drainage. To a depth of about 12 to 15 inches it consists of a grayish-brown mellow silt loam. Below this is light-brown silt loam splotched with gray, rust brown, and yellow. Considerable chert generally occurs in the lower layer, and a bed of water-worn chert is at a depth of 40 to 60 inches in many places.

SHANNON, HYMON, AND BEECHY SERIES

The Shannon, Hyman, and Beechy soils have formed from alluvium consisting of a mixture of materials washed from uplands underlain by loess and Coastal Plain material. All these soils are very young, and no definite genetic horizons have developed. All receive deposits of alluvial material during floods. They differ from the Huntington, Lindsides, and Melvin soils in being derived from materials washed from loess and Coastal Plain sand and clay rather than from limestone, and they are generally lighter in texture and color, more acid, and lower in bases, phosphorus, and nitrogen.

The Shannon soils are brown and well drained. The Hyman are imperfectly drained and to a depth of about 12 inches are grayish brown or light brown, beneath which they are highly mottled with gray, yellow, and rust brown. The poorly drained Beechy soils are prevailingly light-colored and are mottled with various shades of gray and brown from the surface downward.

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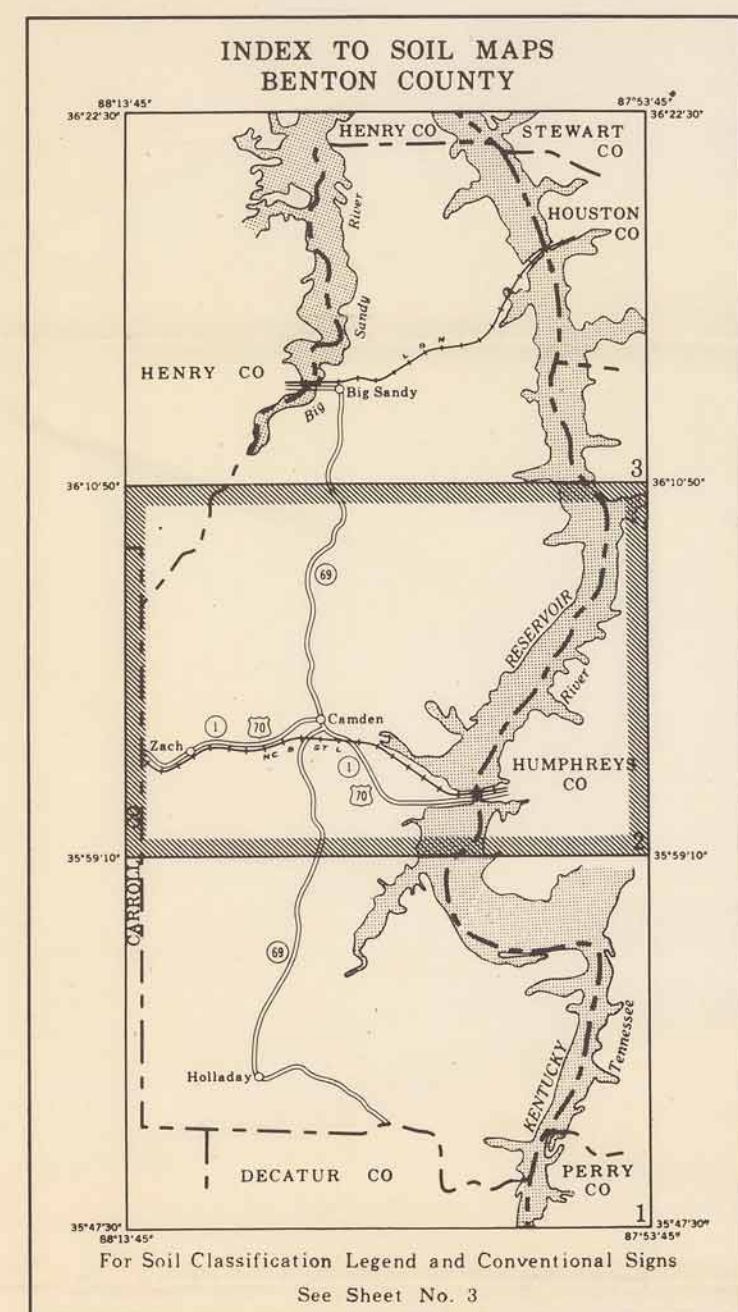
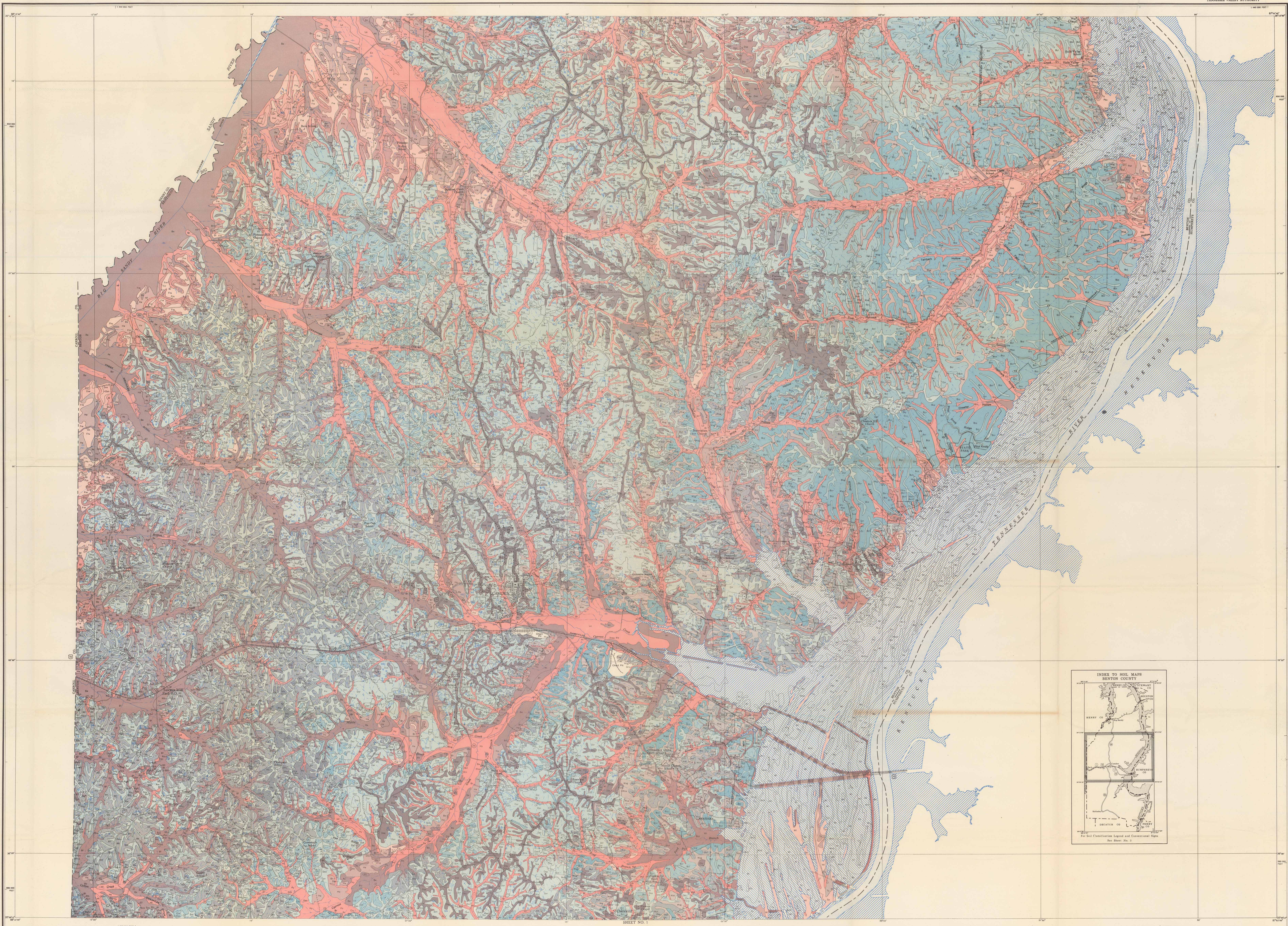
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SOIL LEGEND

Almo silt loam	1-3
Alva fine sandy loam	2-4
Beechy silt loam	0-3
Beechy fine sandy loam	0-3
Bodine cherty silt loam, hilly phase	12-25
Bodine cherty silt loam, eroded hilly phase	12-25
Bodine cherty silt loam, severely eroded hilly phase	12-25
Bodine cherty silt loam, steep phase	25-50
Bodine cherty silt loam, rolling phase	5-12
Brenstrung silt loam	2-4
Bruno loamy fine sand	0-3
Cuthbert fine sandy loam, hilly phase	12-25
Cuthbert fine sandy loam, steep phase	25-50
Cuthbert clay loam, eroded hilly phase	12-25
Cuthbert clay loam, severely eroded hilly phase	12-25
Dexter silt loam, eroded undulating phase	2-5
Dexter silt loam, eroded rolling phase	5-12
Dickson silt loam, undulating phase	2-5
Dickson silt loam, eroded undulating phase	2-5
Dickson silt loam, rolling phase	5-12
Dickson silt loam, eroded rolling phase	5-12
Dickson silty clay loam, severely eroded rolling phase	5-12
Dulac silt loam, undulating phase	2-5
Dulac silt loam, eroded undulating phase	2-5
Dulac silt loam, rolling phase	5-12
Dulac silt loam, eroded rolling phase	5-12
Dulac silty clay loam, severely eroded rolling phase	5-12
Egan silty clay loam	0-3
Ennis silt loam	0-3
Ennis cherty silt loam	0-3
Espora fine sandy loam	2-4
Freeland silt loam, undulating phase	2-5
Freeland silt loam, eroded undulating phase	2-5
Freeland silt loam, rolling phase	5-12
Freeland silt loam, eroded rolling phase	5-12
Freeland clay loam, severely eroded rolling phase	5-12
Greendale cherty silt loam, undulating phase	2-5
Greendale cherty silt loam, rolling phase	5-12
Gunn gravelly loam, hilly phase	12-25
Gunn gravelly loam, steep phase	25-50
Gunn gravelly loam, rolling phase	5-12
Hatcha silt loam	1-3
Hilly story land (Talbott and Culbert soil materials)	15-30
Humphreys silt loam	1-5
Humphreys cherty silt loam	1-5
Hurlington silt loam	0-3
Hymon silt loam	0-3
Hymon fine sandy loam	0-3
Lax silt loam, rolling phase	5-12
Lax silt loam, eroded rolling phase	5-12
Lax silt loam, eroded undulating phase	2-5
Lax silty clay loam, severely eroded rolling phase	5-12
Lexington-Ruston complex, hilly phases	12-25
Lexington-Ruston complex, severely eroded hilly phases	12-25
Lindside silt loam	0-3
Lindside silty clay loam	0-3
Lobellville silt loam	0-3
Melvin silt loam	0-3
Mountriview silt loam, rolling shallow phase	5-12
Mountriview silt loam, eroded rolling shallow phase	5-12
Mountriview silt loam, hilly shallow phase	12-25
Mountriview silt loam, eroded hilly shallow phase	12-25
Mountriview silty clay loam, severely eroded rolling shallow phase	5-12
Padon silt loam, undulating phase	2-5
Padon silt loam, eroded rolling phase	5-12
Providence silt loam, undulating phase	2-5
Providence silt loam, eroded undulating phase	2-5
Providence silt loam, rolling phase	5-15
Providence silt loam, eroded rolling phase	5-12
Providence silty clay loam, severely eroded rolling phase	5-15
Robertsville silt loam	1-3
Rough gulled land (Cuthbert soil material)	5-30
Rough gulled land (Ruston soil material)	5-30
Ruston fine sandy loam, hilly phase	15-25
Ruston fine sandy loam, eroded hilly phase	15-25
Ruston fine sandy loam, steep phase	25-50
Ruston sandy clay loam, severely eroded hilly phase	15-25
Brund fine sandy loam	0-3

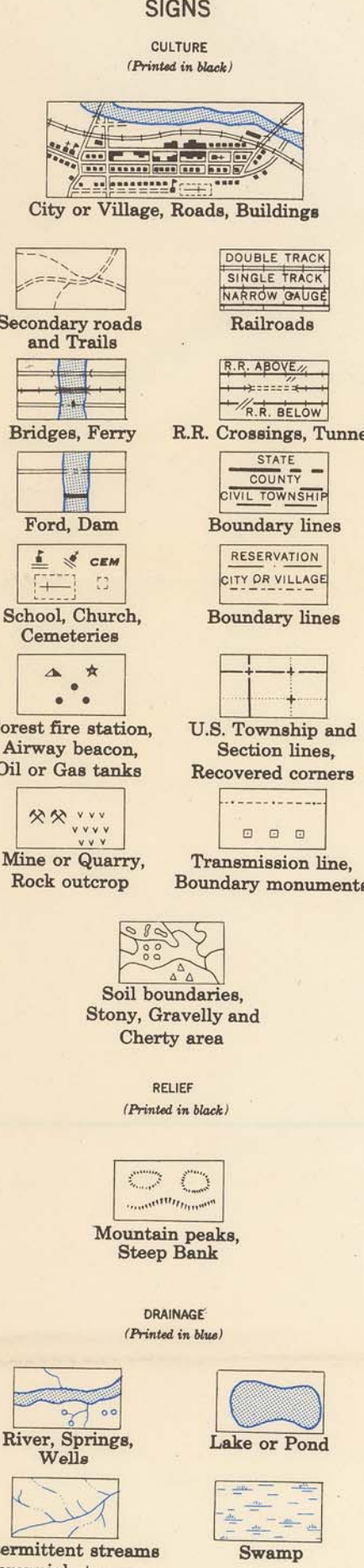
SOIL LEGEND
(CONTINUED)

Safford very fine sandy loam, hilly phase	12-25
Safford very fine sandy loam, rolling phase	5-12
Safford very fine sandy loam, steep phase	25-50
Safford clay loam, eroded hilly phase	12-25
Safford clay loam, eroded rolling phase	5-12
Safford clay loam, severely eroded hilly phase	12-25
Savannah very fine sandy loam, rolling phase	5-15
Savannah very fine sandy loam, eroded rolling phase	5-15
Savannah clay loam, severely eroded rolling phase	5-15
Savannah silty clay loam	1-5
Shannon silt loam	0-3
Shannon fine sandy loam	0-3
Shubbs fine sandy loam, rolling phase	5-12
Taft silt loam	1-3
Topsh silt loam, eroded rolling phase	5-12
Wooten silt loam	1-5
Wooten silty clay loam, eroded phase	1-5

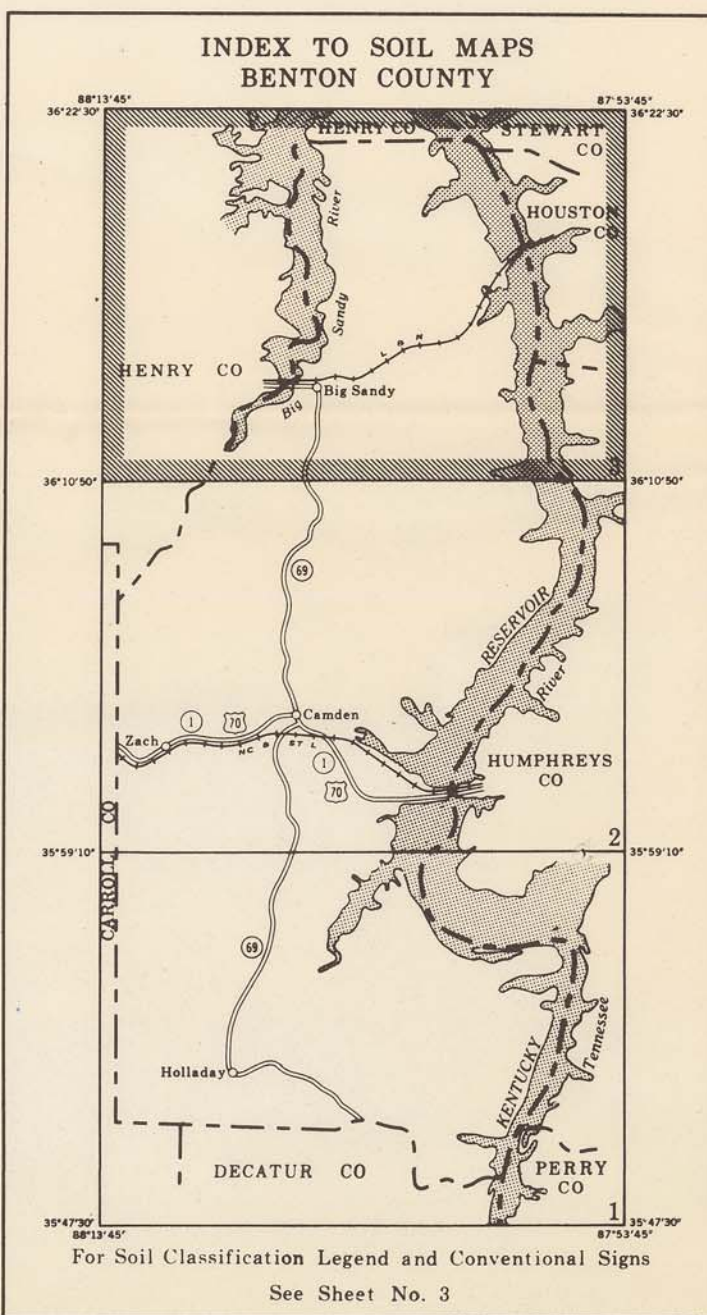
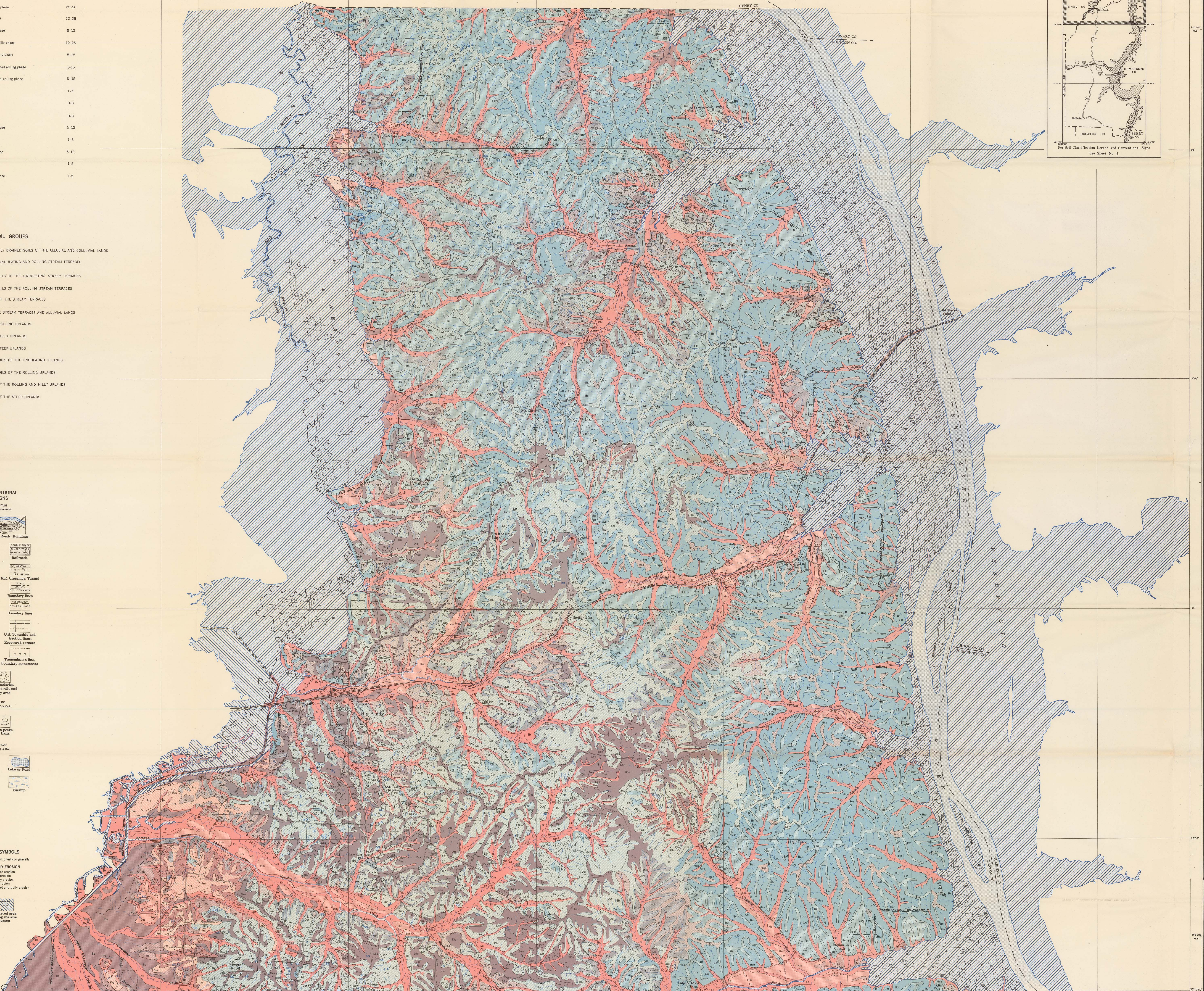
SOIL GROUPS

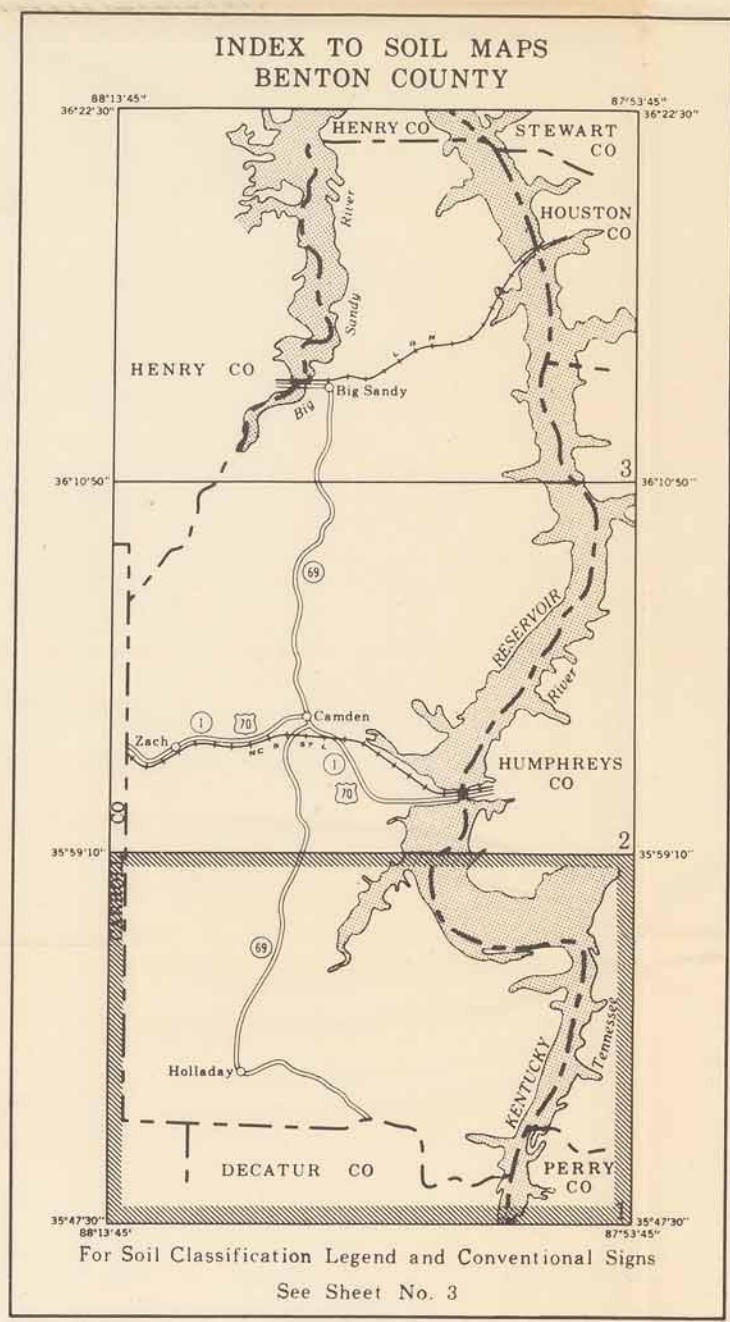
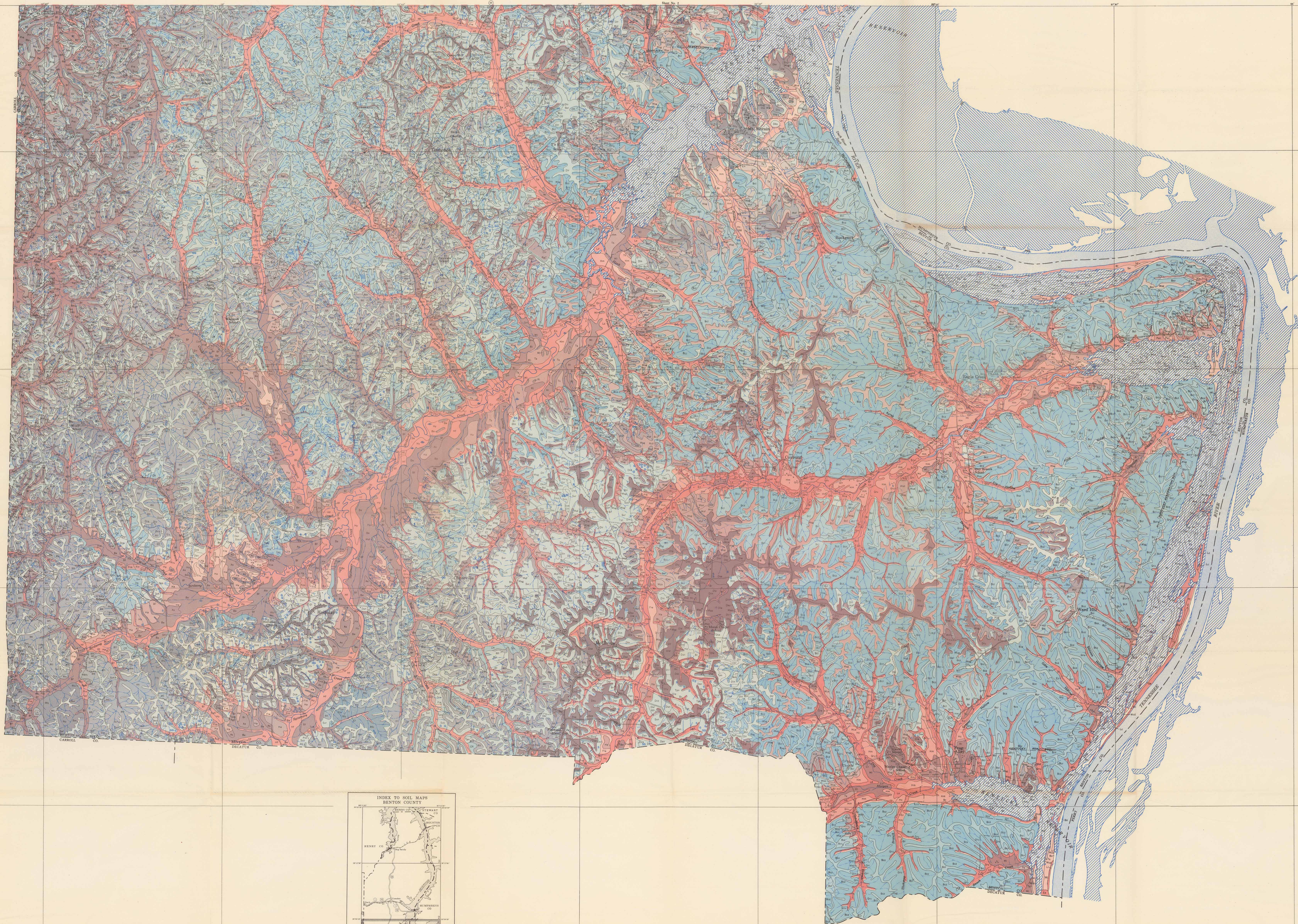
WELL-DRAINAGE AND IMPROPERLY DRAINAGE SOILS OF THE ALLUVIAL AND COLLUVIAL LANDS
WELL-DRAINAGE SOILS OF THE UNDULATING AND ROLLING STREAM TERRACES
MODERATELY WELL-DRAINAGE SOILS OF THE UNDULATING STREAM TERRACES
MODERATELY WELL-DRAINAGE SOILS OF THE ROLLING STREAM TERRACES
IMPROPERLY DRAINAGE SOILS OF THE STREAM TERRACES
POORLY DRAINAGE SOILS OF THE STREAM TERRACES AND ALLUVIAL LANDS
WELL-DRAINAGE SOILS OF THE ROLLING UPLANDS
WELL-DRAINAGE SOILS OF THE HILLY UPLANDS
WELL-DRAINAGE SOILS OF THE STEEP UPLANDS
MODERATELY WELL-DRAINAGE SOILS OF THE UNDULATING UPLANDS
MODERATELY WELL-DRAINAGE SOILS OF THE ROLLING UPLANDS
EXCESSIVELY DRAINAGE SOILS OF THE ROLLING AND HILLY UPLANDS
EXCESSIVELY DRAINAGE SOILS OF THE STEEP UPLANDS
MISCELLANEOUS LAND TYPES

CONVENTIONAL
SIGNS



SPECIAL SYMBOLS





SUPPLEMENT TO THE SOIL MAP OF BENTON COUNTY, TENNESSEE, SHOWING PRINCIPAL CHARACTERISTICS OF THE SOILS

Soil	Map symbol	Group (according to legend on soil map)	Slope range	Parent material	Surface soil		Subsoil		Land class ²
					Color ¹		Color ¹	Consistence	
Almo silt loam.....	As	Poorly drained soils of the stream terraces.	<i>Percent</i> 1-3	Old alluvium of mixed loess and Coastal Plain material.	Gray or light gray.....		Mottled gray.....	Friable.....	4
Alva fine sandy loam.....	Af	Well-drained soils of the alluvial and colluvial lands.	2-4	Local alluvium and colluvium, loess and Coastal Plain material.	Grayish brown or brown.....		Light brown or yellowish brown.	Very friable.....	1
Beechy fine sandy loam.....	Bf	Poorly drained soils of the alluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Brownish gray or gray.....		Mottled gray.....	Very friable.....	4
Beechy silt loam.....	Be	Poorly drained soils of the alluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Brownish gray or gray.....		Mottled gray.....	Very friable.....	4
Bodine cherty silt loam: Eroded hilly phase.....	Bch	Excessively drained soils of the rolling and hilly uplands.	12-25	Cherty limestone material.....	Brownish gray or yellowish gray.		Brownish yellow.....	Friable.....	4
Hilly phase.....	Bcl	Excessively drained soils of the rolling and hilly uplands.	12-25	Cherty limestone material.....	Brownish gray or yellowish gray.		Brownish yellow.....	Friable.....	4
Rolling phase.....	Bcr	Excessively drained soils of the rolling and hilly uplands.	5-12	Cherty limestone material.....	Brownish gray or yellowish gray.		Brownish yellow.....	Friable.....	3
Severely eroded hilly phase.....	Bcv	Excessively drained soils of the rolling and hilly uplands.	12-25	Cherty limestone material.....	Brownish gray to grayish yellow.		Brownish yellow.....	Friable.....	5
Steep phase.....	Bcz	Excessively drained soils of the steep uplands.	25-60	Cherty limestone material.....	Brownish gray or yellowish gray.		Brownish yellow.....	Friable.....	5
Briensburg silt loam.....	Br	Imperfectly drained soils of the alluvial and colluvial lands.	2-4	Local alluvium or colluvium, chiefly loess.	Grayish brown.....		Light brown, mottled below about 16 inches.	Very friable.....	2
Bruno loamy fine sand.....	Bl	Well-drained soils of the alluvial and colluvial lands.	0-3	Alluvium chiefly from sandstone or Coastal Plain sands and limestone material.	Grayish brown, light brown, or yellowish brown.		Light brown or yellowish brown.	Very friable.....	3
Cuthbert clay loam: Eroded hilly phase.....	Cch	Excessively drained soils of the rolling and hilly uplands.	12-25	Heavy sandy clay Coastal Plain material.	Grayish yellow.....		Mottled reddish yellow.....	Strongly plastic.....	5
Severely eroded hilly phase.....	Ccv	Excessively drained soils of the rolling and hilly uplands.	12-25	Heavy sandy clay Coastal Plain material.	Grayish yellow or reddish yellow.		Mottled reddish yellow.....	Strongly plastic.....	5
Cuthbert fine sandy loam: Hilly phase.....	Cfl	Excessively drained soils of the rolling and hilly uplands.	12-25	Heavy sandy clay Coastal Plain material.	Gray or yellowish gray.....		Mottled reddish yellow.....	Strongly plastic.....	5
Steep phase.....	Cfz	Excessively drained soils of the steep uplands.	25-50	Heavy sandy clay Coastal Plain material.	Gray or yellowish gray.....		Mottled reddish yellow.....	Strongly plastic.....	5
Dexter silt loam: Eroded rolling phase.....	Dxn	Well-drained soils of the rolling stream terraces.	5-12	Old alluvium of mixed loess and Coastal Plain material.	Grayish brown or brown.....		Reddish brown.....	Friable.....	2
Eroded undulating phase.....	Dxe	Well-drained soils of the undulating stream terraces.	2-5	Old alluvium of mixed loess and Coastal Plain material.	Grayish brown or brown.....		Reddish brown.....	Friable.....	1
Dickson silt loam: Eroded rolling phase.....	Dln	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	3
Eroded undulating phase.....	Dle	Moderately well-drained soils of the rolling uplands.	2-5	Loess or loesslike material underlain by cherty limestone.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	2
Rolling phase.....	Dlr	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Undulating phase.....	Dlu	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain by cherty limestone.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Dickson silty clay loam, severely eroded rolling phase.....	Dks	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Dulac silt loam: Eroded rolling phase.....	Dsn	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain chiefly by heavy sandy clay.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	3
Eroded undulating phase.....	Dse	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain chiefly by heavy sandy clay.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	2
Rolling phase.....	Dsr	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain chiefly by heavy sandy clay.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Undulating phase.....	Dsu	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain chiefly by heavy sandy clay.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Dulac silty clay loam, severely eroded rolling phase.....	Dcs	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain chiefly by heavy sandy clay.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Egam silty clay loam.....	Es	Well-drained soils of the alluvial and colluvial lands.	0-3	Mixed alluvium, including limestone material.	Dark grayish brown.....		Grayish brown to yellowish brown.	Moderately compact.	2
Ennis cherty silt loam.....	Ec	Well-drained soils of the alluvial and colluvial lands.	0-3	Alluvium, chiefly cherty limestone material.	Grayish brown to light brown.		Light brown.....	Very friable.....	2
Ennis silt loam.....	En	Well-drained soils of the alluvial and colluvial lands.	0-3	Alluvium, chiefly cherty limestone material.	Grayish brown to light brown.		Light brown.....	Very friable.....	1
Eupora fine sandy loam.....	Ef	Imperfectly drained soils of the alluvial and colluvial lands.	2-4	Local alluvium or colluvium, loess and Coastal Plain material.	Grayish brown.....		Light brown, mottled below about 16 inches.	Very friable.....	2
Freeland clay loam, severely eroded rolling phase.....	Fcs	Moderately well-drained soils of the rolling stream terraces.	5-12	Old alluvium of mixed loess and Coastal Plain material.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Freeland silt loam: Eroded rolling phase.....	Frn	Moderately well-drained soils of the rolling stream terraces.	5-12	Old alluvium of mixed loess and Coastal Plain material.	Grayish yellow to yellowish gray.		Yellowish brown to brownish yellow.	Friable.....	3
Eroded undulating phase.....	Fre	Moderately well-drained soils of the undulating stream terraces.	2-5	Old alluvium of mixed loess and Coastal Plain material.	Grayish yellow to yellowish gray.		Yellowish brown to brownish yellow.	Friable.....	2
Rolling phase.....	Frr	Moderately well-drained soils of the rolling stream terraces.	5-12	Old alluvium of mixed loess and Coastal Plain material.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Undulating phase.....	Fru	Moderately well-drained soils of the undulating stream terraces.	2-5	Old alluvium of mixed loess and Coastal Plain material.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Greendale cherty silt loam: Rolling phase.....	Grr	Well-drained soils of the alluvial and colluvial lands.	5-12	Local alluvium or colluvium, chiefly cherty limestone material.	Grayish brown or brownish gray.		Light brown or yellowish brown.	Friable.....	3
Undulating phase.....	Gru	Well-drained soils of the alluvial and colluvial lands.	2-5	Local alluvium or colluvium, chiefly cherty limestone material.	Grayish brown or brownish gray.		Light brown or yellowish brown.	Friable.....	2
Guin gravelly loam: Hilly phase.....	Ggl	Excessively drained soils of the rolling and hilly uplands.	12-25	Gravelly material.....	Gray to yellowish gray.....		Gray to grayish yellow.....	Loose to very friable.	5
Rolling phase.....	Ggr	Excessively drained soils of the rolling and hilly uplands.	5-12	Gravelly material.....	Gray to yellowish gray.....		Gray to grayish yellow.....	Loose to very friable.	5
Steep phase.....	Ggz	Excessively drained soils of the steep uplands.	25-50	Gravelly material.....	Gray to yellowish gray.....		Gray to grayish yellow.....	Loose to very friable.	5
Hatchie silt loam.....	Ha	Imperfectly drained soils of the stream terraces.	1-3	Old alluvium of mixed loess and Coastal Plain material.	Gray to yellowish gray.....		Pale yellow, splotted.....	Friable.....	3
Hilly stony land (Talbott and Colbert soil materials).	HsT	Miscellaneous land types.....	15-30	Limestone material.....	About 50 percent of surface covered with bedrock outcrops; Talbott and Colbert soil materials between outcrops.				5
Humphreys cherty silt loam.....	Hc	Well-drained soils of the undulating stream terraces.	1-5	Old alluvium, chiefly cherty limestone.	Grayish brown to brown.....		Light brown or yellowish brown.	Friable.....	2
Humphreys silt loam.....	Hm	Well-drained soils of the undulating stream terraces.	1-5	Old alluvium, chiefly cherty limestone.	Grayish brown to brown.....		Light brown or yellowish brown.	Friable.....	1
Huntington silt loam.....	Hi	Well-drained soils of the alluvial and colluvial lands.	0-3	Mixed alluvium, including limestone material.	Brown or light brown.....		Light brown.....	Friable.....	1
Hymon fine sandy loam.....	Hf	Imperfectly drained soils of the alluvial and colluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Grayish brown or light brown.		Light brown, mottled below about 16 inches.	Very friable.....	2
Hymon silt loam.....	Hy	Imperfectly drained soils of the alluvial and colluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Grayish brown or light brown.		Light brown, mottled below about 16 inches.	Very friable.....	2
Lax silt loam: Eroding rolling phase.....	Lsn	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by gravelly material.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	3
Eroding undulating phase.....	Lse	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain by gravelly material.	Grayish yellow to yellowish gray.		Yellowish brown to brownish yellow.	Friable.....	3
Rolling phase.....	Lsr	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by gravelly material.	Yellowish gray.....		Yellowish brown to brownish yellow.	Friable.....	2
Lax silty clay loam, severely eroded rolling phase.....	Lxs	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by gravelly material.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Lexington-Ruston complex: Hilly phases.....	LRI	Well-drained soils of the hilly uplands.	12-25	Loess and sandy Coastal Plain material.	A complex of Lexington and Ruston soils.....			Friable to very friable.	4
Severely eroded hilly phases.....	LRv	Well-drained soils of the hilly uplands.	12-25	Loess and sandy Coastal Plain material.	A complex of severely eroded Lexington and Ruston soils.....			Friable to very friable.	5
Lindside silt loam.....	Li	Imperfectly drained soils of the alluvial and colluvial lands.	0-3	Alluvium, chiefly limestone material.	Brown or grayish brown.....		Brown, mottled below about 16 inches.	Very friable.....	2
Lindside silty clay loam.....	Lc	Imperfectly drained soils of the alluvial and colluvial lands.	0-3	Alluvium, chiefly limestone material.	Brown or grayish brown.....		Brownish gray, mottled below about 16 inches.	Friable.....	3
Lobelville silt loam.....	Lo	Imperfectly drained soils of the alluvial and colluvial lands.	0-3	Alluvium, chiefly cherty limestone material.	Grayish brown.....		Light brown, mottled below about 16 inches.	Very friable.....	2
Meivin silt loam.....	Ml	Poorly drained soils of the alluvial lands.	0-3	Mixed alluvium, including limestone material.	Brownish gray or gray.....		Mottled gray.....	Friable.....	4
Mountview silt loam: Eroded hilly shallow phase.....	Mst	Well-drained soils of the hilly uplands.	12-25	Loess or loesslike material underlain by cherty limestone material.	Grayish yellow.....		Brownish yellow.....	Friable.....	4
Eroded rolling shallow phase.....	Mso	Well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone material.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	3
Hilly shallow phase.....	Msf	Well-drained soils of the hilly uplands.	12-25	Loess or loesslike material underlain by cherty limestone material.	Yellowish gray to grayish yellow.		Brownish yellow.....	Friable.....	4
Rolling shallow phase.....	Msg	Well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone material.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	2
Mountview silty clay loam, severely eroded rolling shallow phase.....	Mca	Well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by cherty limestone material.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Paden silt loam: Eroded rolling phase.....	Psn	Moderately well-drained soils of the rolling stream terraces.	5-12	Loesslike material underlain by old mixed alluvium.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	3
Undulating phase.....	Psu	Moderately well-drained soils of the undulating stream terraces.	2-5	Loesslike material underlain by old mixed alluvium.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	2
Providence silt loam: Eroded rolling phase.....	Prn	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by sandy Coastal Plain material.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	3
Eroded undulating phase.....	Pre	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain by sandy Coastal Plain material.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	2
Rolling phase.....	Prr	Moderately well-drained soils of the rolling uplands.	5-15	Loess or loesslike material underlain by sandy Coastal Plain material.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	2
Undulating phase.....	Pru	Moderately well-drained soils of the undulating uplands.	2-5	Loess or loesslike material underlain by sandy Coastal Plain material.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	2
Providence silty clay loam, severely eroded rolling phase.....	Pcs	Moderately well-drained soils of the rolling uplands.	5-15	Loess or loesslike material underlain by sandy Coastal Plain material.	Grayish yellow to brownish yellow.		Yellowish brown to brownish yellow.	Friable.....	4
Robertsville silt loam.....	Rl	Poorly drained soils of the stream terraces.	1-3	Old mixed alluvium, partly from limestone.	Gray.....		Gray, mottled.....	Friable.....	4
Rough gullied land: Cuthbert soil material.....	RgC	Miscellaneous land types.....	5-30	Clay or sandy clay Coastal Plain material.	Land formerly covered by Cuthbert soils that has been reduced to a network of gullies by erosion.				5
Ruston soil material.....	RgR	Miscellaneous land types.....	5-30	Sandy Coastal Plain material.....	Land formerly covered by Ruston soils that has been reduced to a network of gullies by erosion.				5
Ruston fine sandy loam: Eroded hilly phase.....	Rfh	Well-drained soils of the hilly uplands.	15-25	Sandy Coastal Plain material.....	Grayish yellow.....		Reddish brown.....	Very friable.....	5
Hilly phase.....	Rfl	Well-drained soils of the hilly uplands.	15-25	Sandy Coastal Plain material.....	Yellowish gray to grayish yellow.		Reddish brown.....	Very friable.....	5
Steep phase.....	Rfz	Well-drained soils of the steep uplands.	25-60	Sandy Coastal Plain material.....	Yellowish gray to grayish yellow.		Reddish brown.....	Very friable.....	5
Ruston sandy clay loam, severely eroded hilly phase.....	Rtv	Well-drained soils of the hilly uplands.	15-25	Sandy Coastal Plain material.....	Grayish yellow to reddish brown.		Reddish brown.....	Very friable.....	5
Safford clay loam: Eroded hilly phase.....	Slh	Well-drained soils of the hilly uplands.	12-25	Glauconitic sandy clay Coastal Plain material.	Grayish yellow to light reddish brown.		Reddish brown.....	Strongly plastic.....	4
Eroded rolling phase.....	Sln	Well-drained soils of the rolling uplands.	5-12	Glauconitic sandy clay Coastal Plain material.	Grayish yellow to light reddish brown.		Reddish brown.....	Strongly plastic.....	3
Severely eroded hilly phase.....	Slv	Well-drained soils of the hilly uplands.	12-25	Glauconitic sandy clay Coastal Plain material.	Grayish yellow to reddish brown.		Reddish brown.....	Strongly plastic.....	5
Safford very fine sandy loam: Hilly phase.....	Sfl	Well-drained soils of the hilly uplands.	12-25	Glauconitic sandy clay Coastal Plain material.	Yellowish gray to grayish yellow.		Reddish brown.....	Strongly plastic.....	4
Rolling phase.....	Sfr	Well-drained soils of the rolling uplands.	5-12	Glauconitic sandy clay Coastal Plain material.	Yellowish gray to grayish yellow.		Reddish brown.....	Strongly plastic.....	3
Steep phase.....	Sfz	Well-drained soils of the steep uplands.	25-50	Glauconitic sandy clay Coastal Plain material.	Yellowish gray to grayish yellow.		Reddish brown.....	Strongly plastic.....	5
Savannah clay loam, severely eroded rolling phase.....	Scs	Moderately well-drained soils of the rolling uplands.	5-15	Coastal Plain material with a mixture of loess.	Grayish yellow to light yellowish brown.		Yellowish brown to brownish yellow.	Friable.....	4
Savannah very fine sandy loam: Eroded rolling phase.....	Svn	Moderately well-drained soils of the rolling uplands.	5-15	Coastal Plain material with a mixture of loess.	Grayish yellow.....		Yellowish brown to brownish yellow.	Friable.....	3
Rolling phase.....	Svr	Moderately well-drained soils of the rolling uplands.	5-15	Coastal plain material with a mixture of loess.	Yellowish gray to grayish yellow.		Yellowish brown to brownish yellow.	Friable.....	2
Sequatchie fine sandy loam.....	Se	Well-drained soils of the undulating stream terraces.	1-5	Old alluvium, chiefly sandstone material but including some limestone.	Grayish brown to brown.....		Brown to yellowish brown.	Friable.....	1
Shannon fine sandy loam.....	Sa	Well-drained soils of the alluvial and colluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Grayish brown or brownish gray.		Light brown.....	Very friable.....	1
Shannon silt loam.....	Sn	Well-drained soils of the alluvial and colluvial lands.	0-3	Alluvium of mixed loess and Coastal Plain material.	Grayish brown to brown.....		Light brown.....	Friable.....	1
Shubuta fine sandy loam, rolling phase.....	Shr	Well-drained soils of the rolling uplands.	5-12	Heavy sandy clay Coastal Plain material.	Grayish yellow to yellowish gray.		Yellowish red to reddish yellow.	Strongly plastic.....	3
Taft silt loam.....	Ts	Imperfectly drained soils of the stream terraces.	1-3	Old mixed alluvium partly from limestone.	Gray to yellowish gray.....		Pale yellow, splotted.....	Friable.....	3
Tippah silt loam, eroded rolling phase.....	Tpn	Moderately well-drained soils of the rolling uplands.	5-12	Loess or loesslike material underlain by Coastal Plain clay.	Grayish yellow to light yellowish brown.		Yellowish brown to brownish yellow.	Friable.....	4
Wolftever silt loam.....	Wl	Moderately well-drained soils of the undulating stream terraces.	1-5	Old mixed alluvium partly from limestone.	Brownish gray to grayish brown.		Yellowish brown to brownish yellow.	Moderately compact.	2
Wolftever silty clay loam, eroded phase.....	Wcd	Moderately well-drained soils of the undulating stream terraces.	1-5	Old mixed alluvium partly from limestone.	Grayish brown to yellowish brown.		Yellowish brown to brownish yellow.	Moderately compact.	2

¹ In soils of the alluvial and colluvial lands very little difference is apparent in texture and consistence from the surface downward, but some difference in color is generally present.

² On the basis of differences in productivity, workability, and conservability, the soils are grouped in five classes: 1, First-class; 2, Second-class; 3, Third-class; 4, Fourth-class; and 5, Fifth-class soils.